225-00612A

Gas Chromatograph Mass Spectrometer

GCMS-QP2010

Service Manual

Introduction

This Service Manual is intended for service personnel authorized by Shimadzu Corporation. It describes maintenance of the GCMS-QP2010 instrument.
Untrained personnel must not attempt maintenance work on the instrument. No responsibility is accepted for work conducted by untrained personnel.

Safety Precautions

Before starting work, read and fully understand the Danger, Warning, Caution, and Notes safety items in the yellow page at the beginning of the GCMS-QP2010 System User Guide (225-00822).
The GCMS-QP2010 contains hot parts, such as the GC2010 heater unit, interface heater unit, and ion-source heater unit, a high-voltage power supply for the detector unit, and high-voltage circuits such as the vacuum-measurement circuit. Take sufficient care when handling high-temperature and high-voltage units.

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(2) Some parts in this Service Manual may differ from the actual instrument. Due to product modifications, we reserve the right to change this manual without notice.
(3) This Service Manual is considered complete at the time of production. Any errors or omissions discovered may not be remedied immediately.

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1. Installation

Day 1

1. Checking Installation Conditions
2. Unpacking, Assembly, Installation
3. Environment Settings, Start-up
4. Leak Check, Auto-tuning

Day 2

5. Auto-tuning
6. Qualitative Analysis (SCAN Mode)

Day 3

7. Quantitative Analysis (SIM Mode)
8. S/N Measurements(EI mode)

Day 4

9. Batch Processing, Report Printing, QA/QC
10. Maintenance

Day 5

11. S/N Measurements(CI MODE) OPTION

Day 6

12. S/N Measurements(NCI MODE) OPTION

Day 7

13.DI check (OPTION)

The schedule above is a basic guide only. Follow it flexibly, according to the customer's situation and the progress of the installation work. The schedule above is for a standard installation; it does not include inspection with customer's samples or instruction on analysis. (Inspection with customer's samples and instruction on analysis require extra days for installation.)

This section describes the entire installation process. Refer to the Installation Manual (225-00816) supplied for details about assembling the instrument during installation.

Day 1

1. Checking Installation Conditions

Confirm the installation conditions, according to the Installation Completion Checksheet (ZEAV-0416).

Check the power supply.

1)power requirements

Frequency requirements

MS power supply: 115V±5%, 1000VA

230v±5%,1000VA

GC power supply: 115V±5%, 1800VA

230V±5%,2600VA

230V±5%, 2600VA for high-power oven specification.

Not including GC options.

In addition,power for the pc,monitor,and printer must be provided.

CAUTION: USE the PC,monitor,and printer that conform to the law and regulation in respective

NOTE: Be sure sure that power is supplied from a apower sourse with a ground fault breaker in

*There may be instance in which the current capacity will increase as options are attached.

2) Ground : 100Ω or less

3)Voltage Fluctuation Range

Specified power supply voltage range:±5%

Operating power supply voltage range:±10%

NOTE: Voltage fluctuations are established so that the instrument can operate at full capacity within the range of ±10%,including any transient noise in the AC line. Note,however,that the voltage fluctuation range that guarantees the performance specifications should be used within ±5%.・The degree of frequency stability of power source should be within ±0.5%.

4) Power cable connection

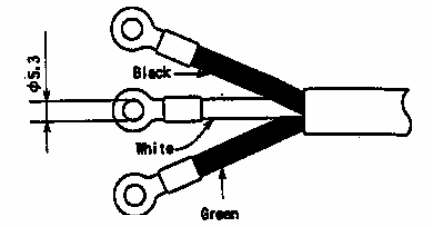
The end of power cables for GC and MS constructed as shown below.

Power cables for GC

Black: Connected to the HOT side of AC line.

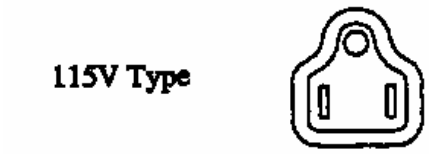
White: Connected to the NEUTRAL side of AC line.

GREEN: For grounding

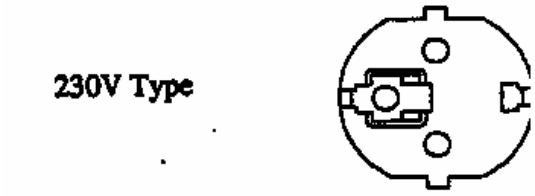


Power cable for MS

115V Type



230V Type



CAUTION: Be sure to ground the instruments to avoid shock hazards.

Check the installation position.

☐ Can a space of at least 300mm at the rear and 400mm at the left of the instrument be maintained?

☐ Is the desk strong enough to easily support about 110kg?

☐ Is the temperature in the range 18 to 28°C ?

☐ Humidity: 40% to 70%(with no condensation)

Check the gas.

☐ Is the He gas of at least 99.995% purity?

Check the exhaust system.

☐ Is an exhaust duct system available?

If not, attach an EMF3 (042-00124-31) oil-mist filter.

CAUTION: Do not place flammable materials near the air exhaust hole of the columm oven in the Back of the GC.Failure to avoid them may be csuse a fire.

The checkbox marks (☐) indicate check items in the Installation Completion Checksheet (ZEAV-0416).

Day 1

2. Unpacking, Assembly, Installation

Unpacking

The entire unit comes in six corrugated-fiberboard boxes: GC, MS, RP, PC, CRT, and printer. The GC unit weighs 30kg and the MS unit weighs 45kg. Take care to avoid accidents when unpacking these heavy boxes. After opening the boxes, check that all accessories have been supplied correctly.

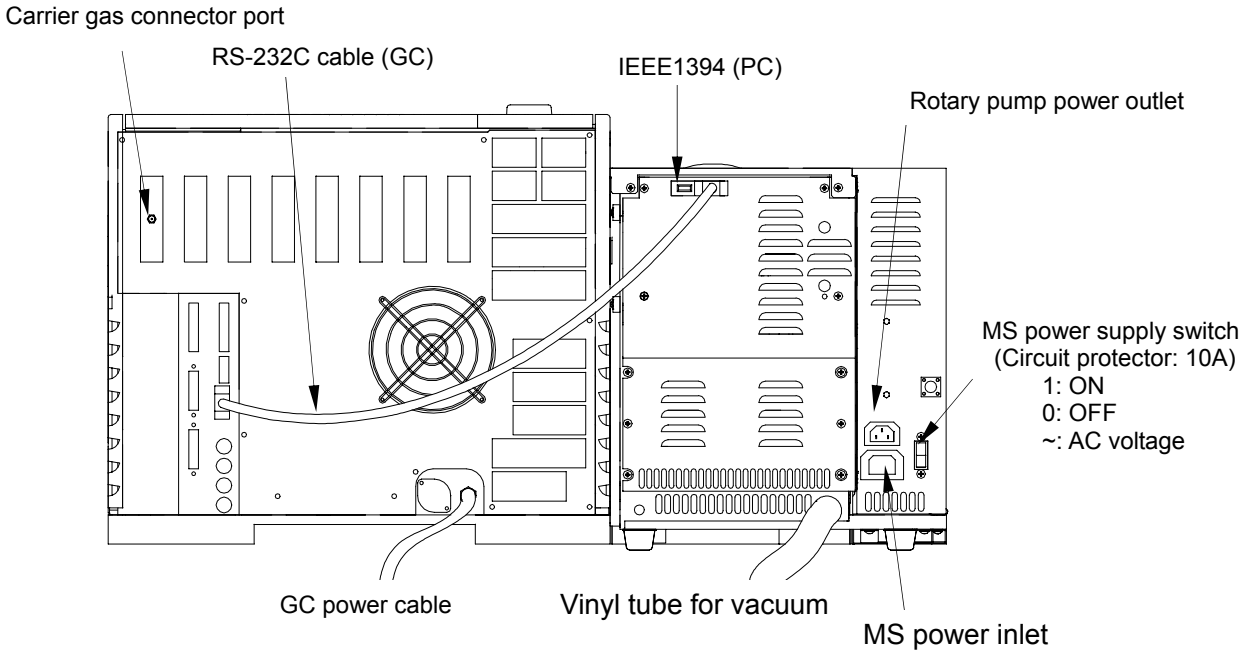
Assembly

Check that the desk is strong enough to easily support the GC, MS, and PC (totaling approximately 110kg) and does not distort or become unstable.

Position the instrument with a space of at least 300mm at the rear and 400mm at the left of the MS unit.

Connect the wiring and tubes as shown in the diagram below.

GC/MS Rear View



Check the following points before turning on the power.

AC line insulation checks (with a tester)

GC: Turn on the main switch and confirm that the resistance across the power line and earth exceeds the limit of measurement.

MS: Confirm that the resistance of the I/F heater (connector ③ or ⑥ to earth) exceeds the

limit of measurement.

Turn on the main switch and confirm that the resistance across the power line and earth exceeds the limit of measurement.

Other visual insulation checks

Open the front door of the analysis tube and check that the filament heater and thermocouple are in the correct positions. Check that the wiring does not contact the surrounding components.

Check the following points about the carrier gas connections.

Carrier gas pressure

The operational gas supply pressure to the GC is in the range 300 to 980kPa. But some supply pressures have a limiting effect on the pressures that can be set at the GC. The normal supply pressure is 700 to 800kPa.

Carrier gas purity

Leaks from the pipes and organic matter can hinder high-accuracy measurements (particularly for integrated piping).

Residual air in pipes and air in the analyzer also have an adverse influence on analysis.

Be sure to conduct the following checks when connecting the pipes:

① Purge the pipes. (Place a piece of paper over the end of pipes and check that no color is visible.)

② Sniff the gas to check it has no bad smell.

③ Purge the GC connector for several minutes.

④ Set the GC total flowrate to maximum and leave for 10 to 20 minutes.

Mounting the column

Mount the column, as described in section *3.2 Preparation for Analysis* of the Operation Guide.

Caution

Minute traces of interfering components appear easily in the analysis results due to the high sensitivity of the instrument.

Never touch the septum or glass insert at the inlet with bare hands.

When mounting the column, wipe all parts with acetone before inserting them.

Installation

All required software is preinstalled in the PC set but, unless the latest software versions are installed, the software must be upgraded to the latest version.

Refer to applicable Technical Information for details about how to obtain the latest software and the method of installation.

Day 1

3. Environment Settings, Start-up

Turn on the instrument power supplies in the following sequence:

① pretreatment unit

② GC

③ MS

④ printer and monitor

⑤ PC

When the power is turned on for the first time after connecting the MS and PC, the MS driver is installed automatically. Install the driver in accordance with section 8.8.3 *Installing the MS driver* of the System User Guide.

Outline Procedure (See the System User Guide for more details.)

Press [Next (N)].

Display the list of the known drivers of the device.

Select “Another Device”.

Press [Next (N)].

Press [Use Disk].

Insert the CD-ROM

Enter "E:¥Driver" and press [Enter].

Select “Shimadzu GCMS-QP2010”.

Press [Next (N)].

Press [Next (N)].

Environment settings

Set up the software environment, as described in section *3.3 System Configuration* of the Operation Guide.

Start-up

Start evacuation, as described in section *4.1 Starting and Stopping the Vacuum System* of the Operation Guide.

Hint

Press [Manual] on the Start/Stop window to monitor the vacuum status and degree of vacuum.

Go to Section 3 if problems occur!

Day 1

4. Leak Check, Auto-tuning

Leak check

Check for air leaks with the instrument unheated, as described in section *4.2 Leak Check* of the Operation Guide.

☐ Is m/z28 within twice m/z18?

Set the temperature of the ion source, INJ, COL, and interface and repeat the check to ensure stability.

☐ Is the temperature stable (Has the READY lamp gone out?)

☐ Is m/z28 within twice m/z18?

Auto-tuning

Check that auto-tuning can be conducted normally.

Conduct auto-tuning, as described in section *5.1 Auto-tuning* of the Operation Guide.

☐ Is the detector voltage in the tuning report 1.8kV or less?

☐ 0.10 maximum discrepancy between FWHM for m/z69, 219, and 502?

☐ Is m/z69, 131, 219, 264, 414, 502, and 614 mass-number displacement ⊏0.10 max.?

Checks on the Peak Monitor window

☐ Does the peak intensity change when each lens voltage is changed?

☐ Does the m/z69, 219, and 502 peak amplitude drop below 0.50 when the RF offset is increased?

The checkbox marks (☐) indicate check items in the Installation Completion Checksheet (ZEAV-0416).

Settings at the end of the initial day

Set a high GC total flowrate (100 to 200 mL/minute) to lower the residual air in the carrier gas.

Do not increase the ion source or interface temperature above the level required for analysis.

Day 2

5. Auto-tuning

Leak re-check

Conduct a leak check to confirm that the air has reduced since the initial day.

Confirm that m/z32 / m/z31 does not exceed 3 when SI(PFTBA) is inserted.

Check for external abnormalities

Look at the external appearance of the instrument and listen for noises to confirm no abnormalities are present.

Operation Description

Auto-tuning is described in section *5.1 Auto-tuning* of the Operation Guide.

Points to Explain to the Customer

Auto-tuning must be conducted before starting a series of analyses.

Do not conduct auto-tuning between measurement and quantitation.

Conduct auto-tuning while the temperature is stable.

If the instrument was stopped, wait at least two hours for the temperature to stabilize before conducting auto-tuning.

Vacuum leak check in the tuning report.

Confirm that the detector voltage does not exceed 2kV.

Day 2

6. Qualitative Analysis (SCAN Mode)

Describe the method of qualitative analysis using a standard sample, such as OFN 100pg/μL.

Operation Description

Explain the file types described in Section *2.9 Common Operations* of the System User Guide and how to use Data Explorer, and create a new project folder.

Explain the analysis method and data analysis method in accordance with section *6 Qualitative Analysis (SCAN Mode)* of the Operation Guide.

Points to Explain to the Customer

How to use Explorer
How to use the Method Wizard and how to check the methods created
Carrier-gas pressure setting range (column flow to 15mL/minute)
Meaning of "solvent elution time"
Standard values of each parameter
How to save method files
How to register samples
How to run the data-processing program
How to expand TIC
How to eliminate background noise
How to display mass-chromatographs
How to search libraries
How to register spectral processing tables

Conduct an S/N check, if time is available.
See section *8. S/N Measurements* for details about the measurement conditions.

Conduct three measurements. Do not continue the measurements if the S/N is lower than the criteria.
(After several dozen injections, waste from the septum can contaminate the insert, making S/N hard to measure.)

Day 3

7. Quantitative Analysis (SIM Mode)

Describe the method of quantitative analysis using a standard sample, such as OFN 100pg/μL.

Explain the analysis method and quantitation method in accordance with section *7. Quantitative analysis (SIM Mode)* of the Operation Guide.

Points to Explain to the Customer

Principle of SIM, explanation of channels and groups
How to create methods
Settings in Analyzer Monitor
Hot to register target components
Setting quantitation parameters
Creating the Compound Table (using Wizard)
Measuring unknown samples

Day 3

8. S/N Measurements

Measure S/N.(EI MODE)

SAMPLE OFN 1pg/ul (isookutane solvent) 1ul

Measurement Conditions

INJ	250℃
	SPLITLESS mode (sampling time 1.0 minute)
COL:	50℃ (1min) - 40℃ / min - 200℃ (0min) - 15℃ / min - 280℃
I/F:	250℃
IS:	200℃
He:	during injection 250kPa, 1 minute
(HIGH-PRESSUREINJECTION mode)	
	during analysis 120Kpa
Total flow:	50mL/minute
MS:	SCAN mode (mass range: m/z200 to 300)
	interval 0.5s
	detector voltage relative value: +0.4 (absolute value: 1.4 to 1.6kV)
	measurement time: 3.0 to 10.0 minute (solvent elution time: 3 minutes)

Day 4

9. Batch Processing, Report Printing, QA/QC

Describe continuous analysis using section *8. Batch Processing (Continuous Operation)* of the Operation Guide.
(Go through this description, even if the customer has no pretreatment unit or autosampler.)

Points to Explain to the Customer
How to create batch files (using Wizard)

Describe the method of printing reports using section *9.Report Printing* of the Operation Guide.

Points to Explain to the Customer
The differences between the two report formats (graph image and report)
Method of printing graph images
Method of generating reports
How to use templates

Explain the QA/QC functions using section *10. Quality Assurance and Quality Control Functions* of the Operation Guide.

Points to Explain to the Customer
Explain an outline of the QA/QC functions.

Day 4

10. Maintenance

Describe the maintenance of the instrument using section *8.Maintenance* of the Operation Guide.

Points to Explain to the Customer

Precautions to take during maintenance work

Filament replacement procedure

How to mount and dismount the ion source (Emphasize that the screws at the left must be tightened first when mounting the ion source.)

How to conduct leak checks

Maintenance of the INJ unit

Maintenance Schedule Guidelines

The period of maintenance for contamination varies significantly with the analyzed samples, sample concentrations, and analysis frequency. The schedule below is presented as a rough guide only.

Ion-source box	3 to 6 months
Lens assembly	1 to 2 years
Pre-rod	2 to 3 years
Main rod	3 to 5 years
Detector	2 to 3 years
RP	15,000 hours (overhaul recommended)
	(Replace oil every 3,000 hours)
TMP	25,000 hours (overhaul recommended)

This is a guide only. Use it to plan scheduled maintenance.

Day 5

11. S/N Measurements　CI　MODE（OPTION）

Measure S/N.(CI MODE)

Benzophenone 100pg/ul (acetone solvent) 1ul

INJ：　250℃　SPLITLESS MODE (Sampling Time　2.0 min)

COL：　80℃（2min）－30℃／min－260℃（5min）

I／F：　250℃　IS：200℃

He：　during injection and analysis　100Kpa

Total flow　20ml/min

MS：　SCAN MODE （mass range　M/Z　100～250）

interval　0.5sec

detector voltage　relative value　+0.4　（absolute　1.4～1.6　kV）

measurement time　6.0～11.0　min　（solvent elution time　5.5min）

Attention

Please confirm that the sensitivity of EI is sufficient, in the case that the sensitivity of CI and NCI is confirmed.

Day6

12.S/N Measurements　NCI　MODE（OPTION）

Measure S/N.(NCI MODE)

SAMPLE OFN 100fg/ul (isookutane solvent) 1ul

Measurement Conditions

INJ	250℃
	SPLITLESS mode (sampling time 1.0 minute)
COL:	50℃ (1min) - 40℃ / min - 200℃ (0min) - 15℃ / min - 280℃
I/F:	250℃
IS:	200℃
He:	during injection　250kPa, 1 minute　(HIGH-PRESSURE INJECTION mode)
	during analysis　120Kpa
Total flow:	50mL/minute
MS:	SCAN mode (mass range: m/z200 to 300)
	interval　0.5s
	detector voltage　relative value: +0.4 (absolute value: 1.4 to 1.6kV)
	measurement time:　3.0 to 10.0 minutes(solvent elution time: 3 minutes)

Attention

Please confirm that the sensitivity of EI is sufficient, in the case that the sensitivity of CI and NCI is confirmed.

Day 7

13.Mass patern check Measurements　DI　MODE（OPTION）

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cholestane 100ng/ul (acetone solvent) 1ul

MS I/F　100℃
　　IS　250℃

DI temperature　room temperature to 300℃ (40℃ / min)

GC　temperature　constant
　　Colum flow　moderate flow

2. Maintenance

Daily Maintenance

1. MS Navigator

Description of Parts

2. Instrument Configuration
3. Lens Unit
4. Interface Unit
5. Valves
6. MS Filter Unit
7. Detector Unit
8. Turbo Molecular Pump
9. Main Power Unit
10. GC unit

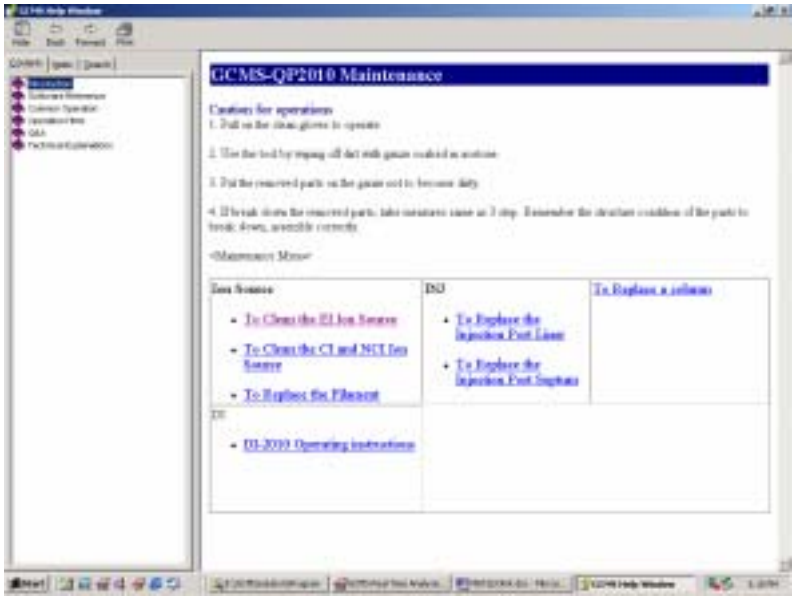
Adjustment Software

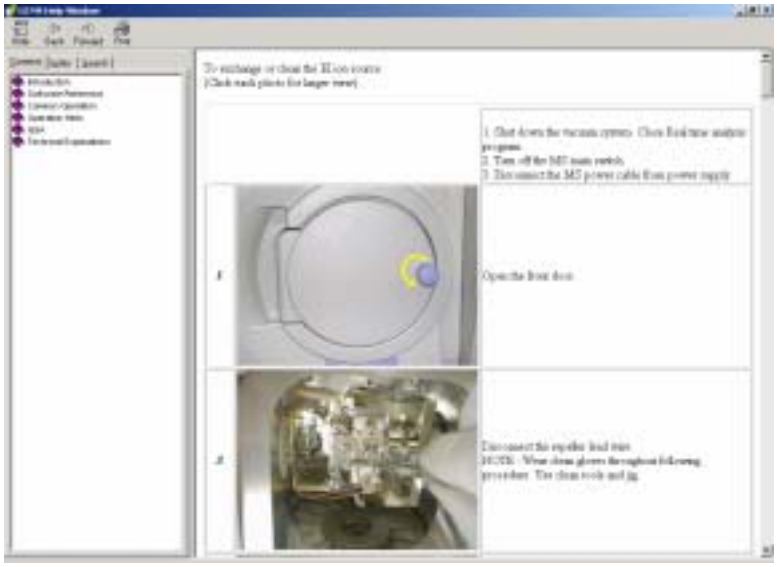
11. Updating the Flash ROM
12. Backing Up and Restoring the E2PROM
13. Adjusting the RF PS Assy.

1. MS Navigator

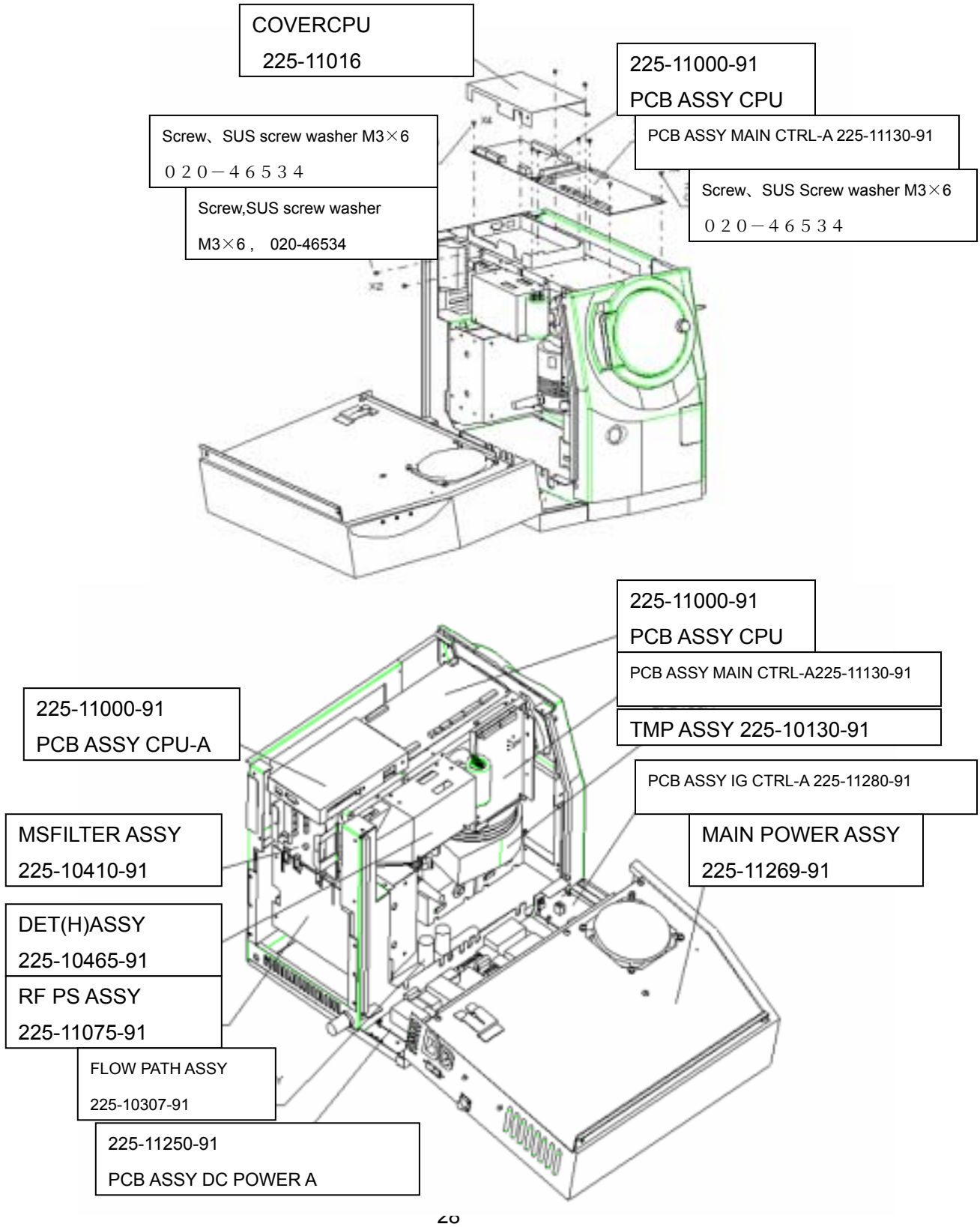
GCMSsolution incorporates the MS Navigator as a guide to normal daily maintenance. Follow the procedure below to use MS Navigator.

1. Run GCMSsolution (Analysis, Post-run, or Edit analysis)
2. In the Help (H) menu, select [Help Contents (C)].
3. The Help window is displayed. Select "Operation hints" and "Maintenance" from the contents list.
4. Select the required item, such as "Replace the filament" or "Ion-source maintenance," to display the associated guidance information.

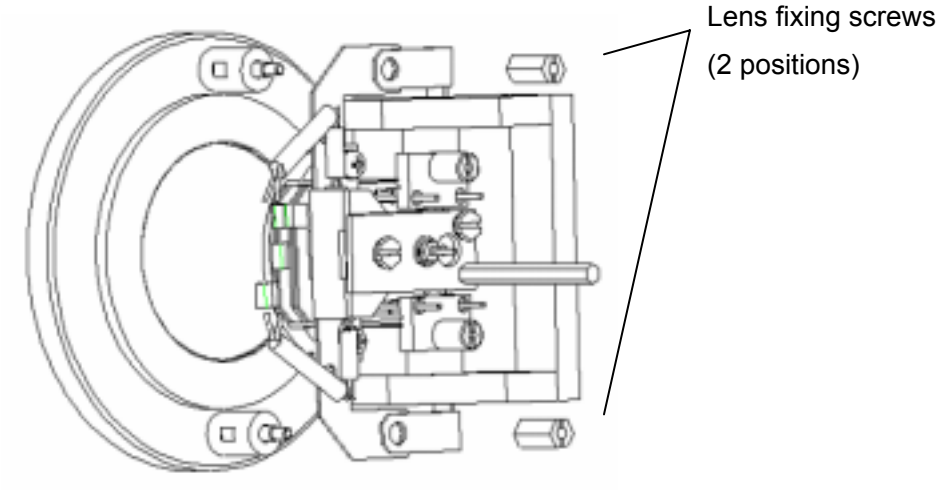




2. Instrument Configuration



3. Lens Unit



Ion-source lens unit removal procedure

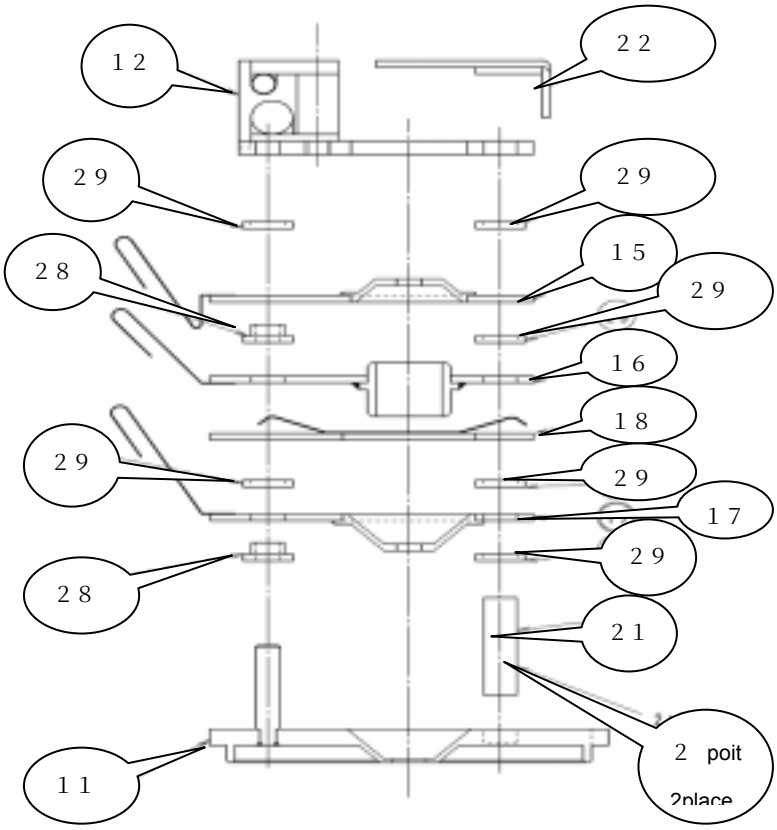
1. Please remove, take a/ column.
2. Remove the ion-source box.
3. Slide the pipe at the tip of the interface to the left. The spring is held by the magnet; remove it carefully.
4. Remove the ion-source heater and platinum sensor pin contactors (4 positions).
5. Remove the lens fixing screws (2 positions)
6. Remove the lens unit, taking care not to apply force to the lens potential contact plate.

Mounting the lens unit

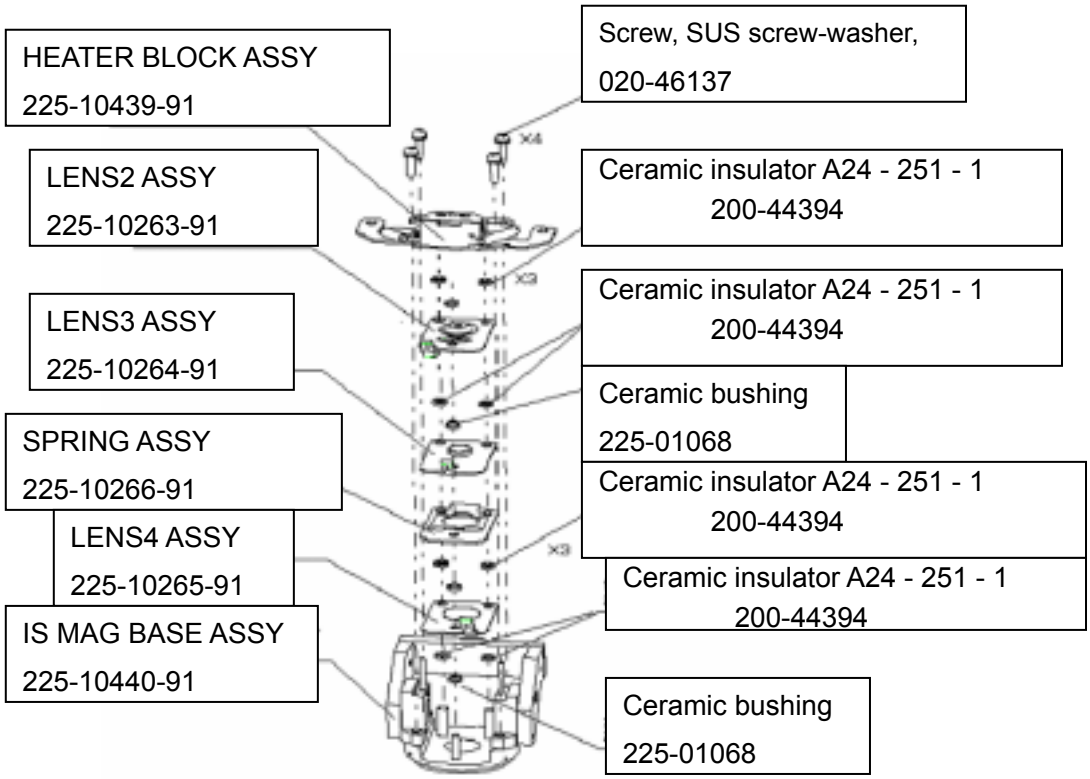
When mounting the lens unit, the force of the lens contact plate slightly lifts the lens unit, making its original position difficult to determine. Therefore, confirm that the positioning pin at the right of the lens unit base plate is in the correct position.

Then, mount the lens unit by reversing the removal procedure described above.

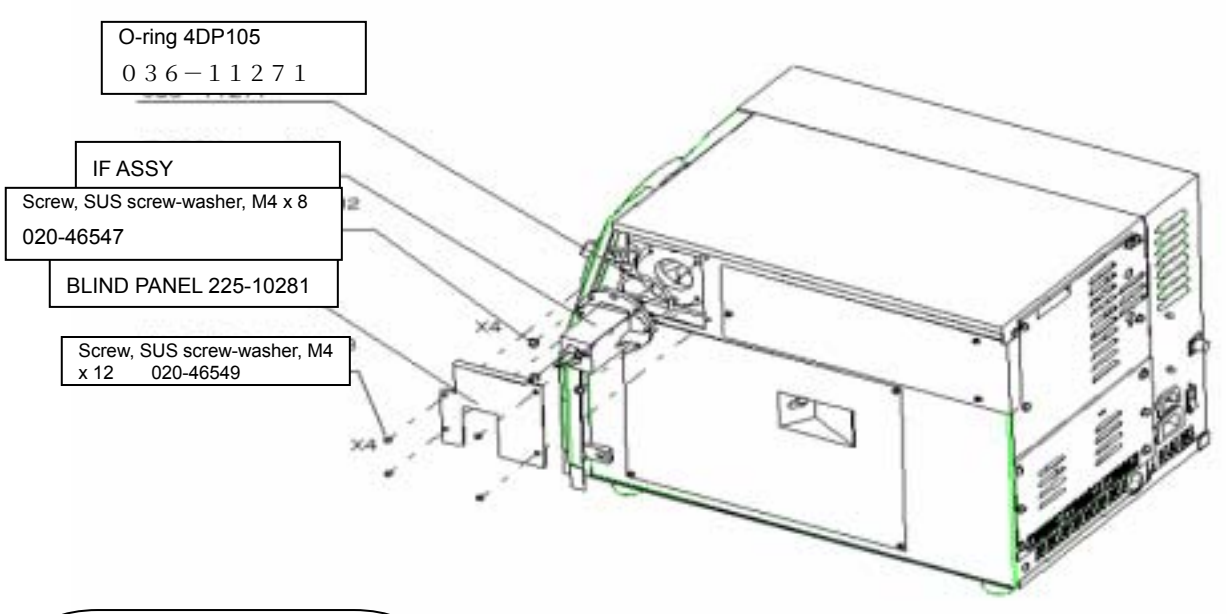
Details of the lens unit

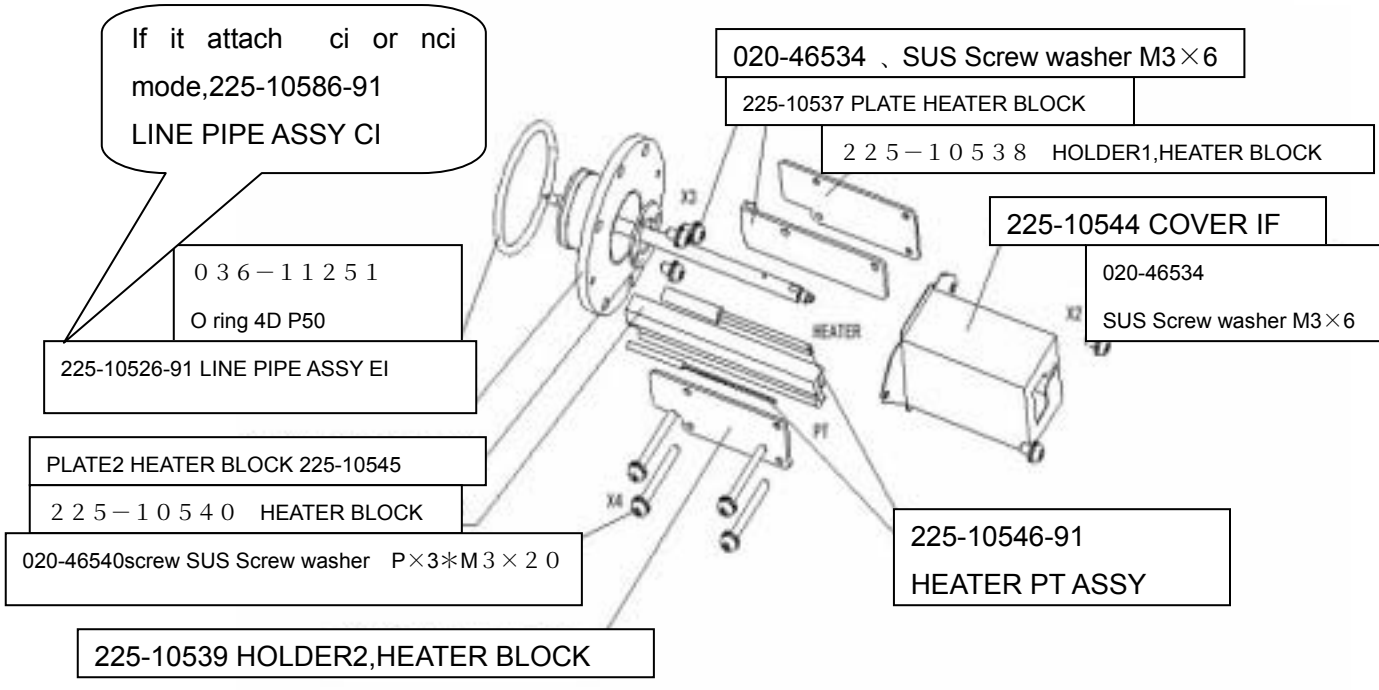


⑪	IS MAG Base Assy	225-10440-91
⑫	Heater Block	225-10439-91
⑮	LENS 2 Assy	225-10263-91
⑯	LENS 3 Assy	225-10264-91
⑰	LENS 4 Assy	225-10265-91
⑱	Spring Assy	225-10266-91
21	Insulator pin (glass)	225-10230-01
22	Plate	225-10257
28	Insulator bushing	225-01068



4. Interface Unit

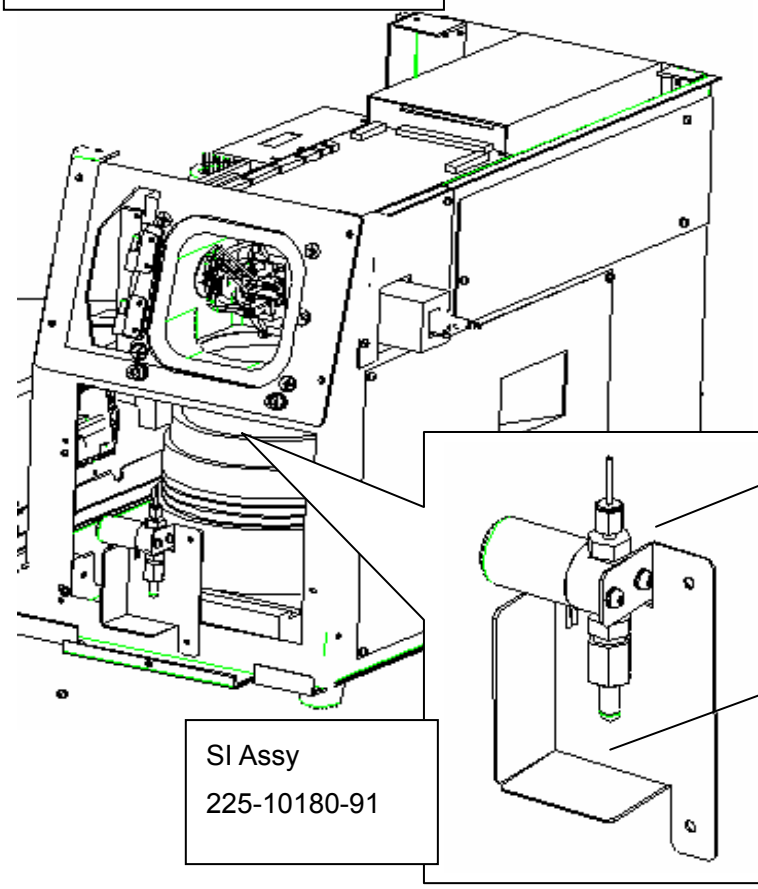




225-10549-91 HEATERBLOCKASSY 100-115V
225-10549-92 HEATER BLOCK ASSY 220-240V
Including heater and PT sensor

5. Valves

Standard Sample Inlet Unit

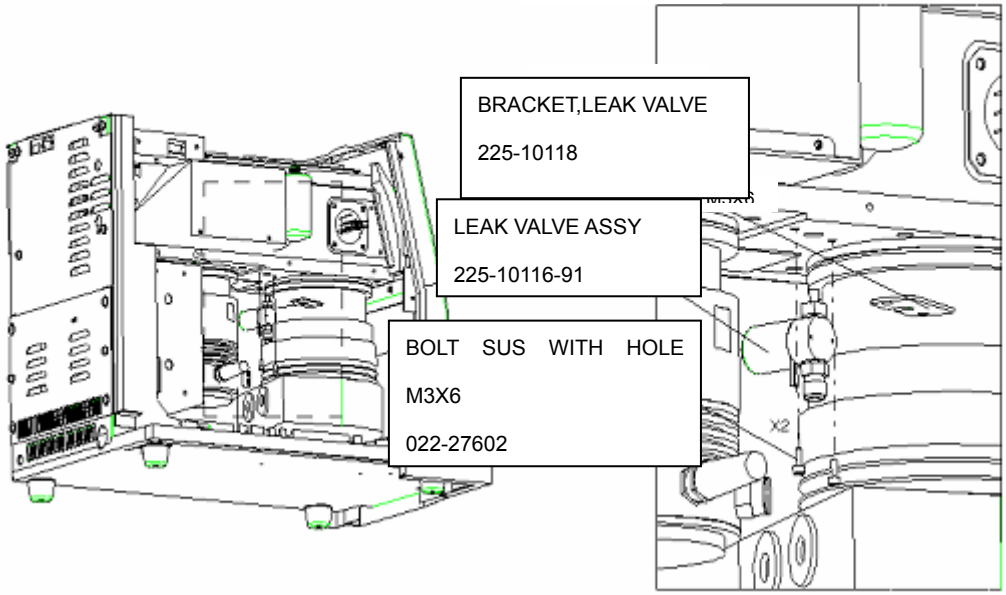


VALVE Assy
225-10179-91

Capillary Assy
225-015559-91
Glass sample pin
225-04257-91
O-ring
036-11202

SI Assy
225-10180-91

Leak Valve



BRACKET,LEAK VALVE
225-10118

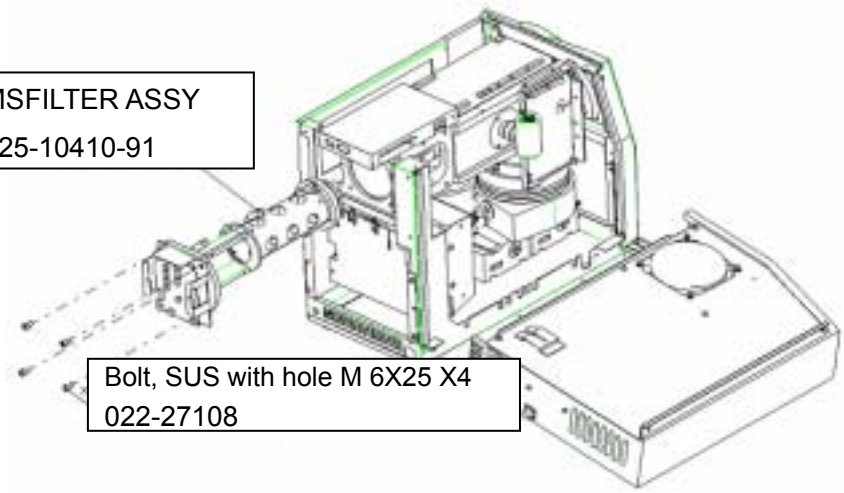
LEAK VALVE ASSY
225-10116-91

BOLT SUS WITH HOLE
M3X6
022-27602

6. MS Filter Unit

MS filter removal procedure

1. Turn off the power. Disconnect the power connector.
2. Remove the DET Assy. (Remove three cables and four screws.)
3. Remove the rear panel. Remove the DIFF PCB unit cover.
4. Disconnect the three connector-terminals from the DIFF PCB.

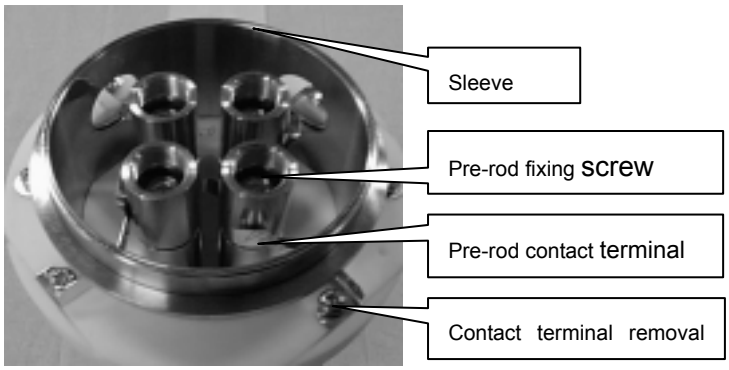


Caution: The PCB is sensitive to static electricity. Touch the chassis before starting work.

5. Remove the four MS FILTER Assy fixing screws.
6. Pull the MS FILTER Assy to the rear.

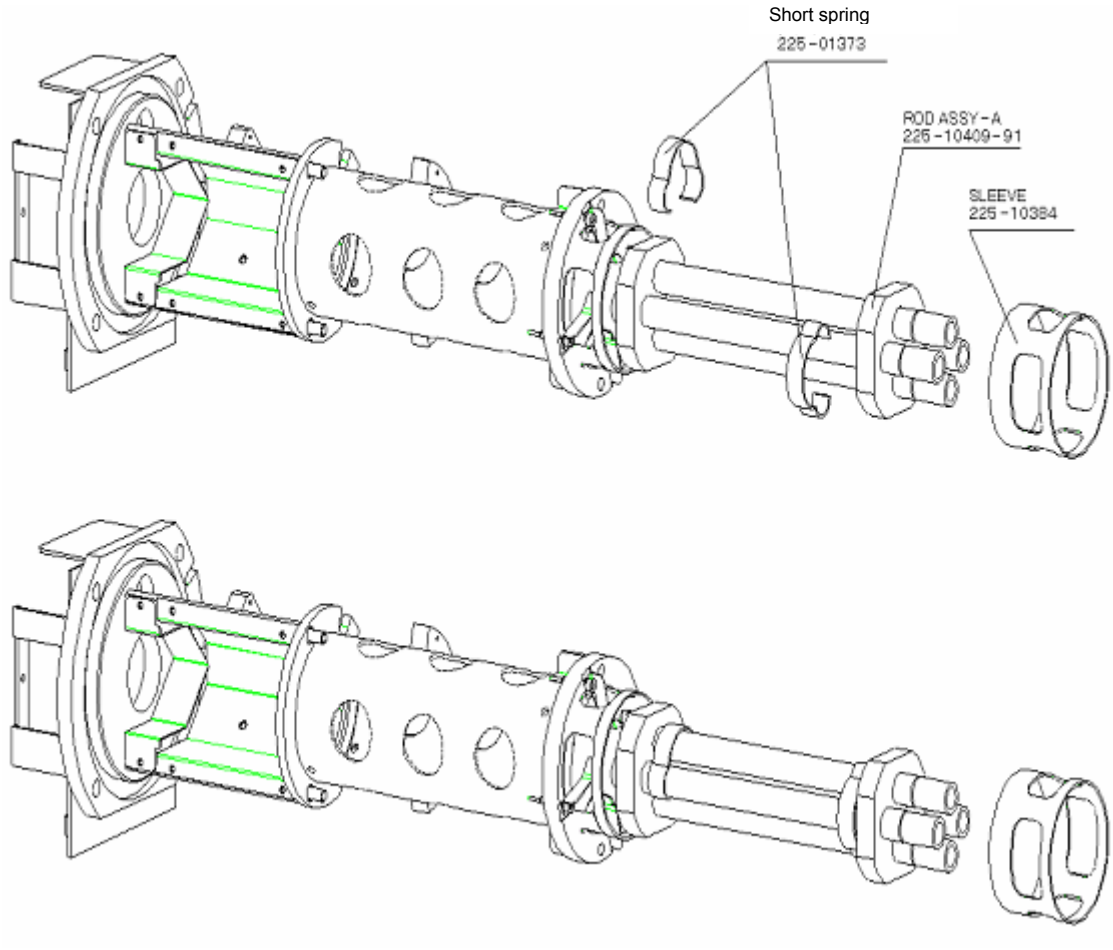
It is hard to move initially; rotate it slightly in each direction before pulling it out.

Take care not to scratch the O-ring faces on the flange and housing.



Pre-rod maintenance

Removing the lens permits pre-rod maintenance from the front panel. If the pre-rod is burned by the ions, loosen the pre-rod fixing screws and rotate the pre-rod 90° to clean it.



Note : The short springs are inside the position shown in the diagram above.

The distance of the springs from the insulators are as follows:

Pre-rod end	17.5mm
Detector end	21.5mm

Removing the ROD Assy

1. Remove the three rod fixing screws.
2. Remove the sleeve.
3. Carefully pull the rods out of the MS FILTER Assy.

Caution

The ROD Assy is specially assembled to micron (1/1000mm) accuracy. Applying shocks or forces to the ROD Assy may cause displacement that has a major effect on the MS performance. Be especially careful when handling the ROD Assy.

7. Detector Unit

Detector (complete) 225-10463-91

Detector (electron multiplier only) 225-09340-11

DET(H)ASSY 225-10465-91

CDD electrode

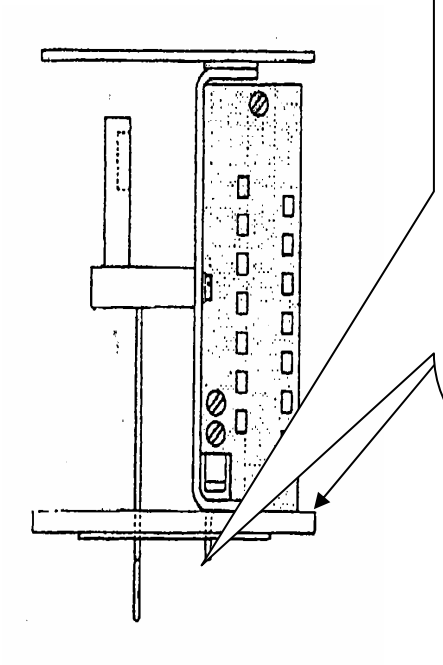
DET LENS

Ion signal connector

APERTUR

PCB PRE AMP-A 225-11030-91

CDD/detector high-voltage power supply
HV PCB ASSY 225-11195-91
OR HV PCB ASSY NCI 225-11195-92



During installation (or replacement), confirm that the signal connector pin, high-voltage connector pin, and detector fixing hooks are connected correctly.

Signal pin to detector signal position 1Ω max.less

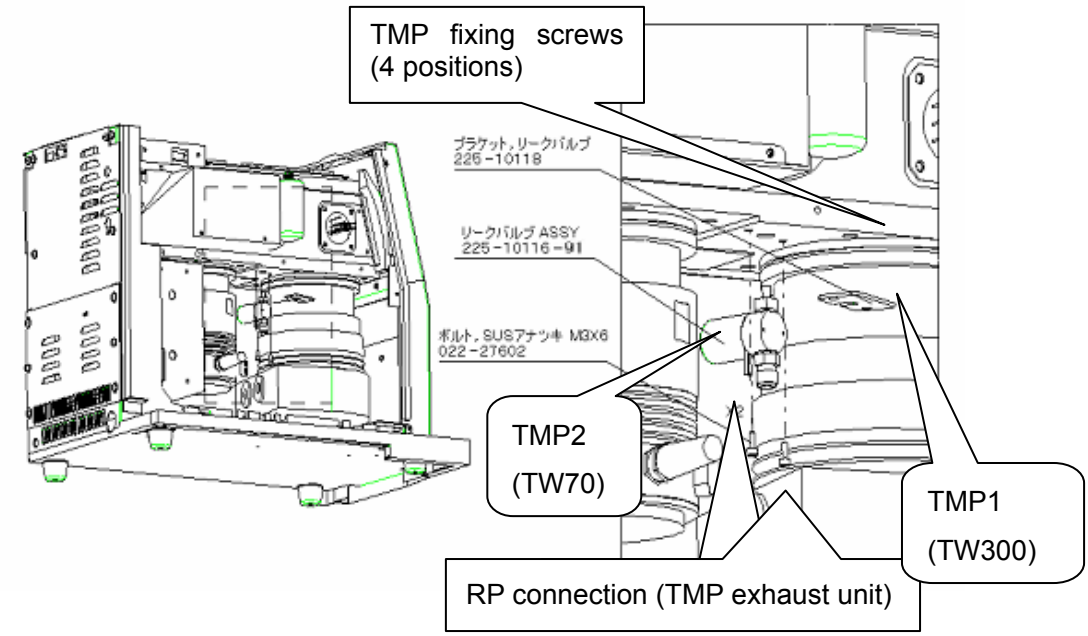
High-voltage pin to detector high-voltage position 1Ω max.less

Earth to detector fixed position 1Ω max less

Defective connections can prevent peak detection or cause signal baseline disturbance.

CCAUTION: The purge is necessary.

8. Turbo Molecular Pump



Two turbo molecular pumps (TMP), one for the ion-source unit exhaust (TW-300) and one for the analyzer exhaust (TW-70), are connected to a single rotary pump (E2M1.5).

Removing the Turbo Molecular Pumps

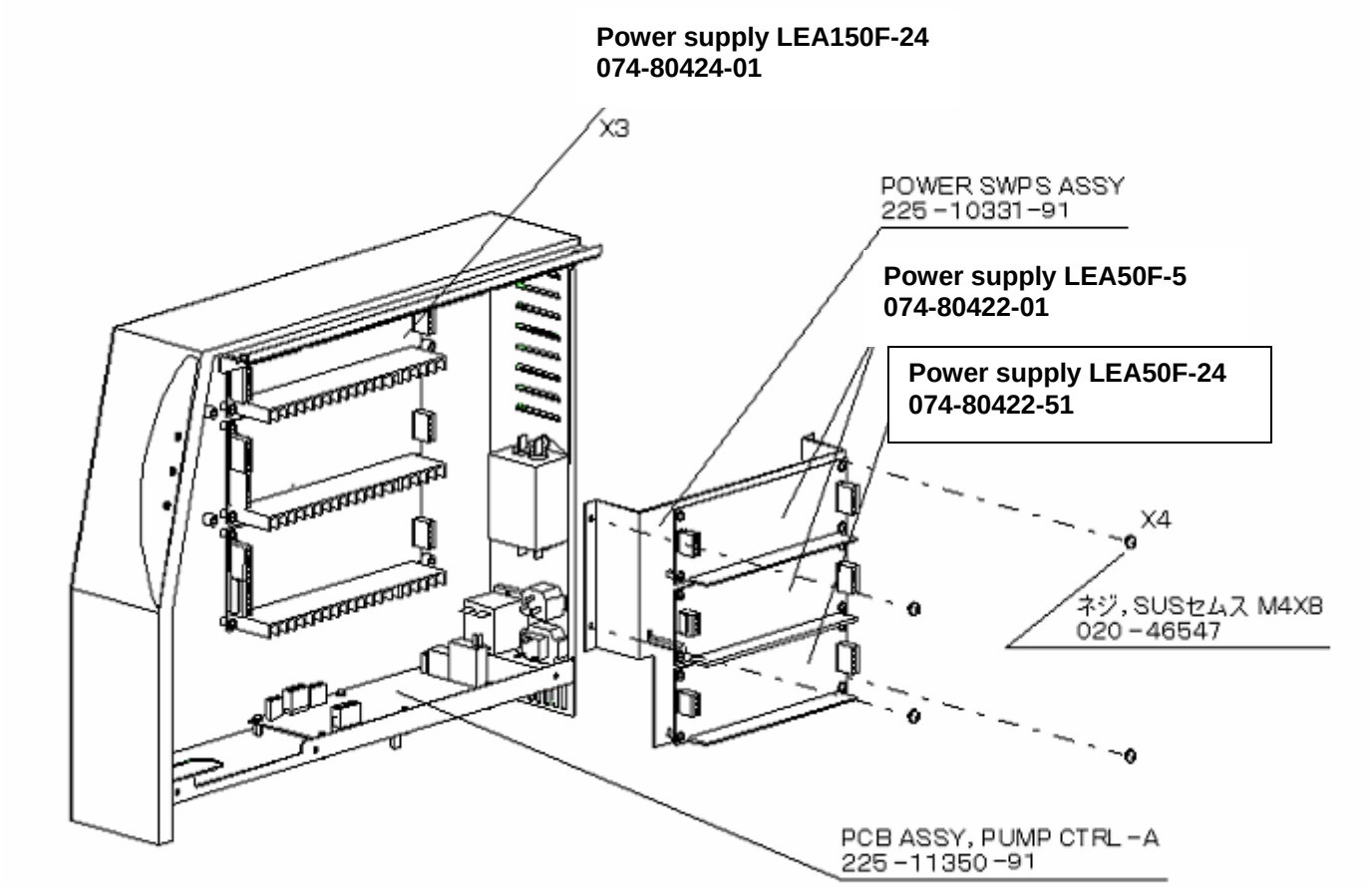
1. Remove IS Cont PCB. Remove the IG tube.
2. Disconnect the TMP exhaust unit from the rotary pump. Loosen and remove the clamp from the KF flange. The TMP1 flange is integral with the TMP body and can be difficult to remove.
3. Disconnect the connector (power) from the power supply.
4. Remove the TMP fixing screws and remove the TMP.
5. Lower TMP1 to the top of the TMP power supply, slide it to the left (as seen from the front), and remove it from the instrument.
6. Reverse this procedure to install the TMP.

Caution Ensure that no dust or dirt sticks to the O-ring at the top of the TMP.
(Purge with dry gas (He, N_2) during installation.)

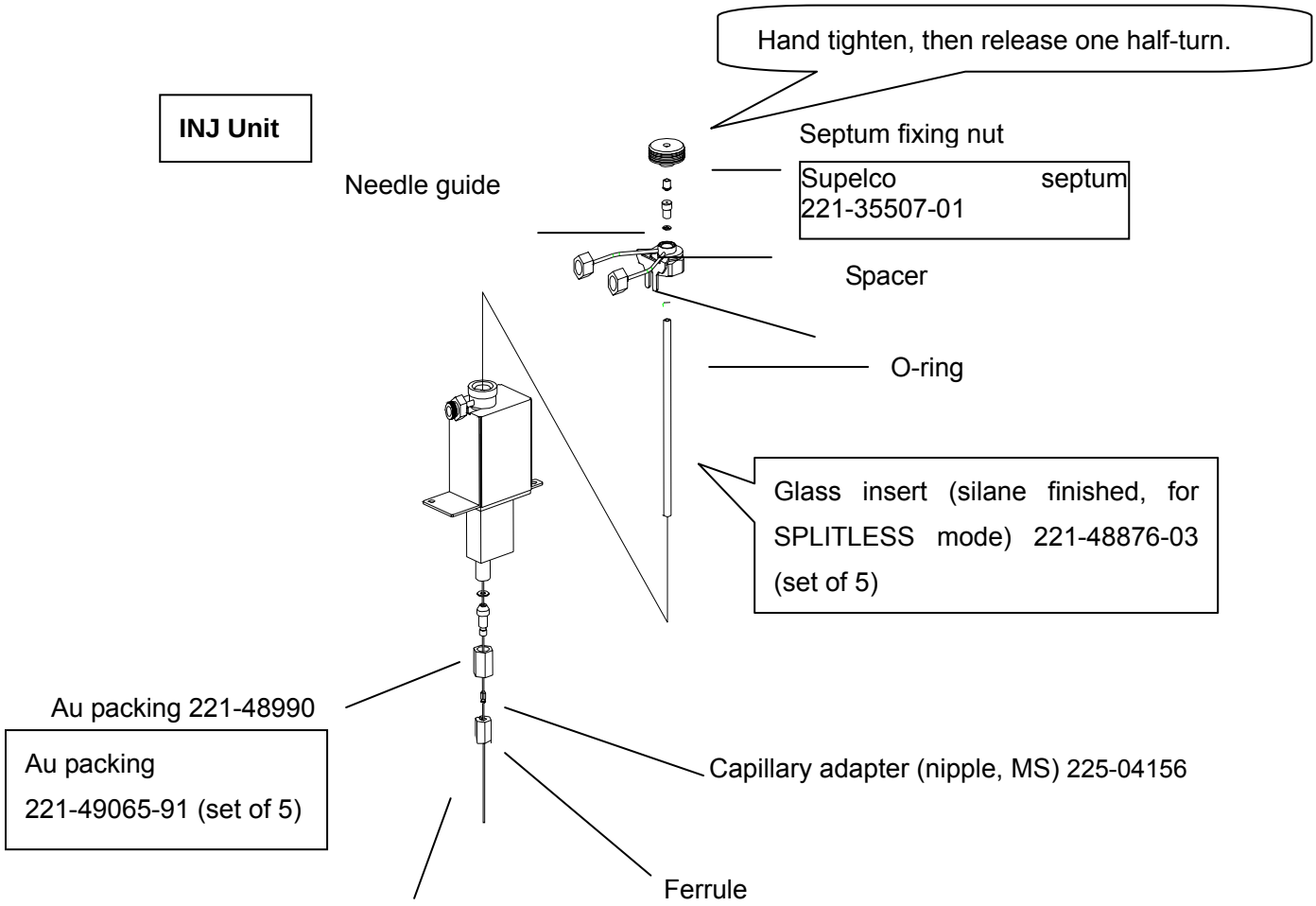
9. Main Power Unit

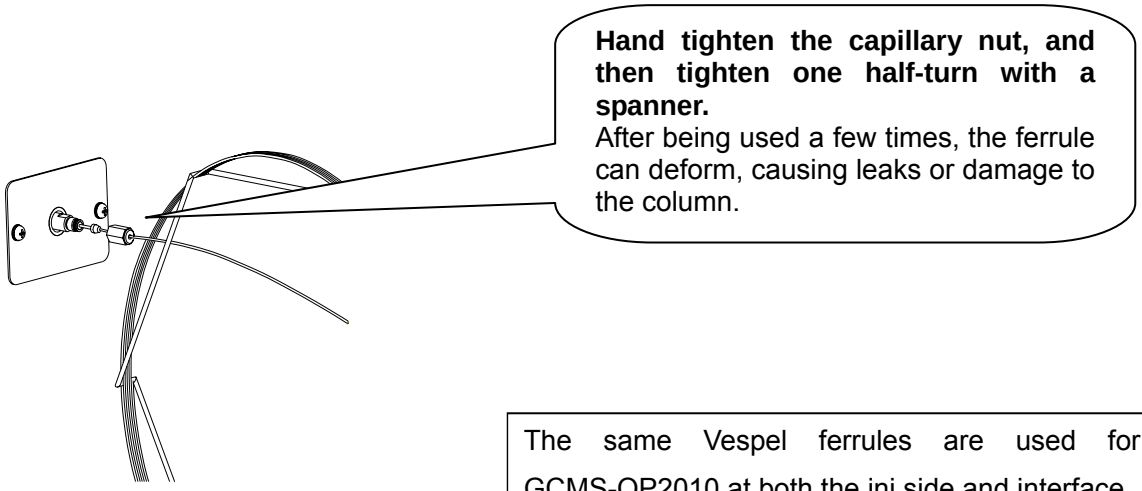
Caution

To prevent electric shocks, disconnect the power cable from the instrument before starting maintenance work on the main power unit.



10. GC Unit




Hand tighten the capillary nut, and then tighten one half-turn with a spanner.
After being used a few times, the ferrule can deform, causing leaks or damage to the column.

The same Vespel ferrules are used for the GCMS-QP2010 at both the inj side and interface.

670-15003-03 for 0.25mm ID

670-15003-04 for 0.32mm ID

670-15003-05 for 0.53mm ID

11. Updating the Flash ROM

A Flash ROM is mounted on the CPU-A PCB in the GCMS-QP2010. Follow the procedure below if a Flash ROM update is required. (The ROM version is displayed in the GCMSsolution System Configuration.)

***Before updating the Flash ROM, stop the instrument (vacuum system) and exit GCMSsolution.**

1. Copy the ROM file to hard disk.
   (Normally copy to C:¥GCMS-QP2010¥MOT.)
2. Run MS2010.EXE.
   (It is normally contained in the directory C:¥GCMSsolution¥Program.)
3. Select "Update FLASH ROM" from the Tools menu.
   (This cannot be selected in CONNECT mode.)

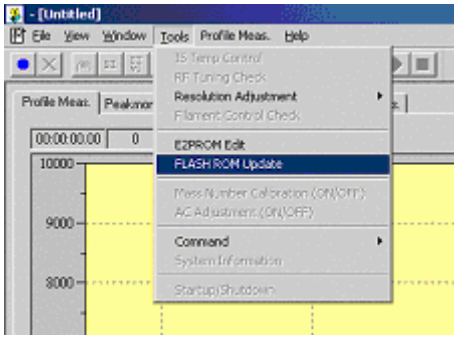


Fig. 1 The FLASH ROM Update window opens.

4. The FLASH ROM Update window opens.

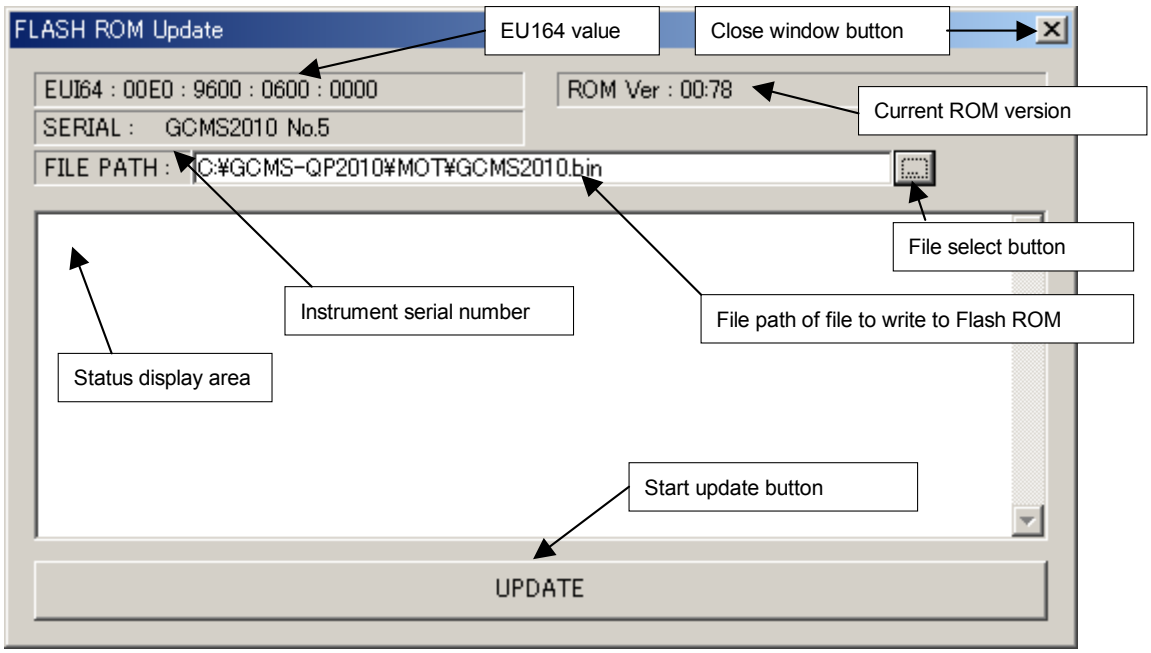


Fig. 2 FLASH ROM Update Window

5. Press the file select button and select the ROM file to update.
   A BIN file is normally selected. An MOT file can also be selected, if available. If an MOT file is selected, when the UPDATE button is clicked, a BIN file is automatically created from the MOT file in the directory where the MOT file exists.
6. Press the UPDATE button. The version information and a message box to confirm the update are displayed. The ROM size and checksum (CHKSUM) values are displayed in the status display area.

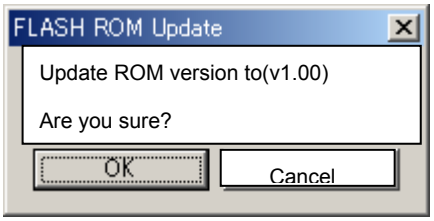


Fig. 3 Message Box to Confirm Update

7. Click the OK button if the ROM size and checksum values are correct. Alternatively, click the Cancel button to halt the update.
8. When the OK button is pressed, the ROM file is transferred to the GCMS-QP2010 and the update process starts. The progress status is displayed in the status display area.
   *** Do not turn off the instrument power during the update!**
9. After the ROM update starts, the READY and FAILURE LED indicators flash alternately.

10. After writing to the Flash ROM is complete, the READY and FAILURE LED indicators flash 20 times simultaneously, the CPU is reset, and the instrument is rebooted.
11. If the instrument reboots normally after the reset is applied, a message indicating that the update is complete is displayed, as shown in Fig. 4.

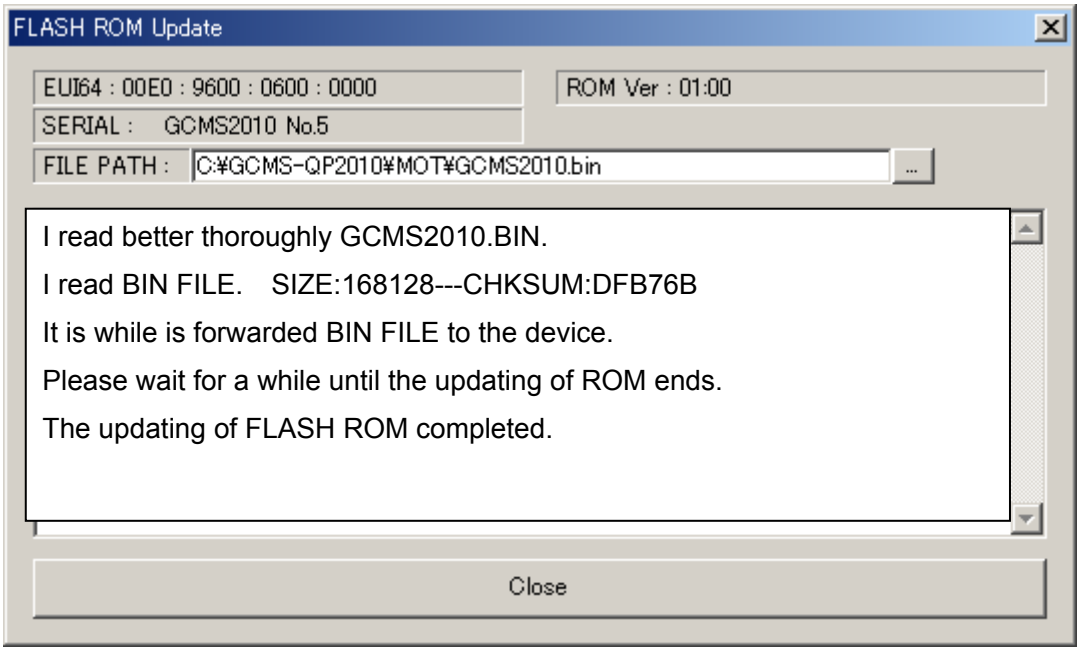

FLASH ROM Update
EUI64 : 00E0 : 9600 : 0600 : 0000
ROM Ver : 01:00
SERIAL : GCMS2010 No.5
FILE PATH : C:¥GCMS-QP2010¥MOT¥GCMS2010.bin
...
I read better thoroughly GCMS2010.BIN.
I read BIN FILE. SIZE:168128---CHKSUM:DFB76B
It is while is forwarded BIN FILE to the device.
Please wait for a while until the updating of ROM ends.
The updating of FLASH ROM completed.
Close

Fig. 4 Status Display when Update is Complete

12. Click the Close button to close the FLASH ROM Update window.

12. Backing Up and Restoring the E2PROM

* MS2010.EXE Version 1.20, or above

An E2PROM mounted on the CPU-A PCB in the GCMS-QP2010 stores various parameters and times of consumable use. After CPU-A replacement, follow the procedure below to copy the E2PROM contents to the new PCB.

Backing up E2PROM Contents

* After GCMSsolution2 is used, the E2PROM contents are automatically backed up in a file named "instrument S/N.bin" in the GCMSsolution2 system directory (C:¥GCMSsolution¥System).

1. Run MS2010.EXE. Select "Edit E2PROM" from the Tools menu. The E2PROM Tool window opens.

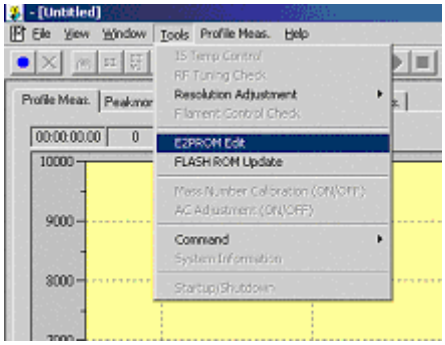


Fig. 1-1 Opening the E2PROM Tool Window

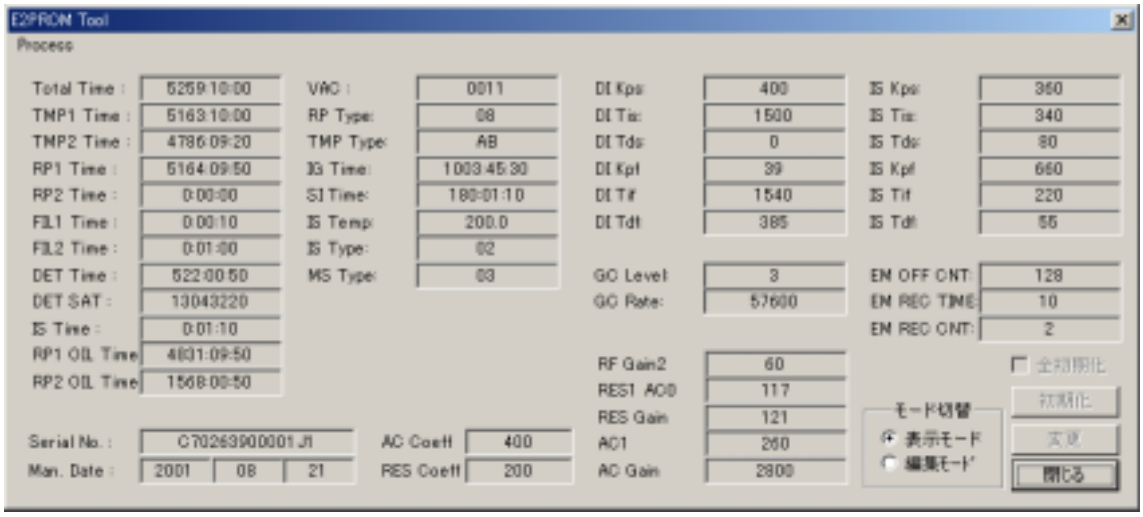


Fig. 1-2 E2PROM Tool Window

2. Select "Backup" from the Process menu.

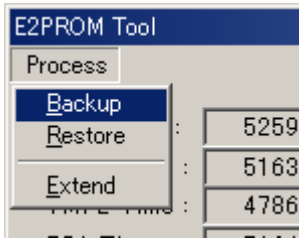


Fig. 1-3 Backup Menu

2. The Save As dialog box opens. Select the directory and file name to be saved, and then click the Save button. The default file name is "instrument S/N.bin".

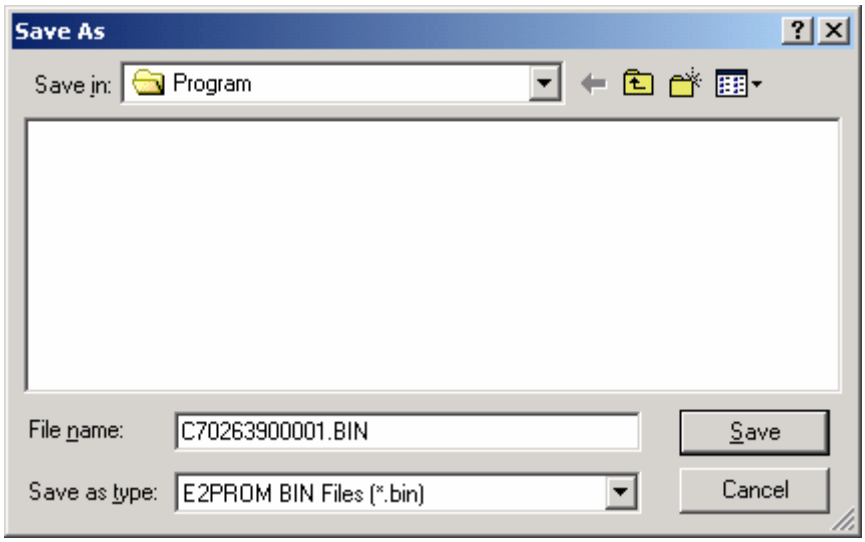


Fig. 1-4 Save As Dialog Box

4. The following message is displayed when the E2PROM backup is complete.

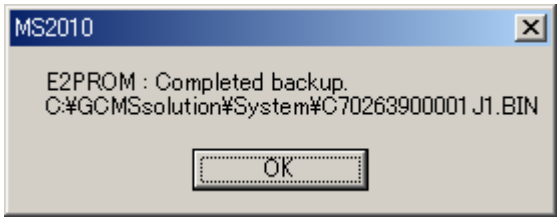


Fig. 1-5 Backup Complete Dialog Box

Changing E2PROM Contents

Use the Edit mode to change the contents of the E2PROM.

Restoring the E2PROM Contents

1. Run MS2010.EXE. Select "Edit E2PROM" from the Tools menu. The EEPROM Tool window opens.

2．Please do about the following contents before the work of the next 3 items.

① Select extend of the Process menu in E2PROM.

② Enter pass word. (MSALPHA)

③ Selsct Edit Mode.

④ Enter Serial No.　(This work in, proper number, for example 12345 even good)

⑤ Select Change(update) Mode.

⑥ Click the ok button.

⑦ Select Display Mode.

3. Select "Restore" from the Process menu.

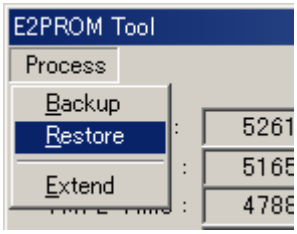


Fig. 2-1 Restore Menu

4. The Open dialog box opens.　Select the E2PROM file name to restore, and then click the Open button.

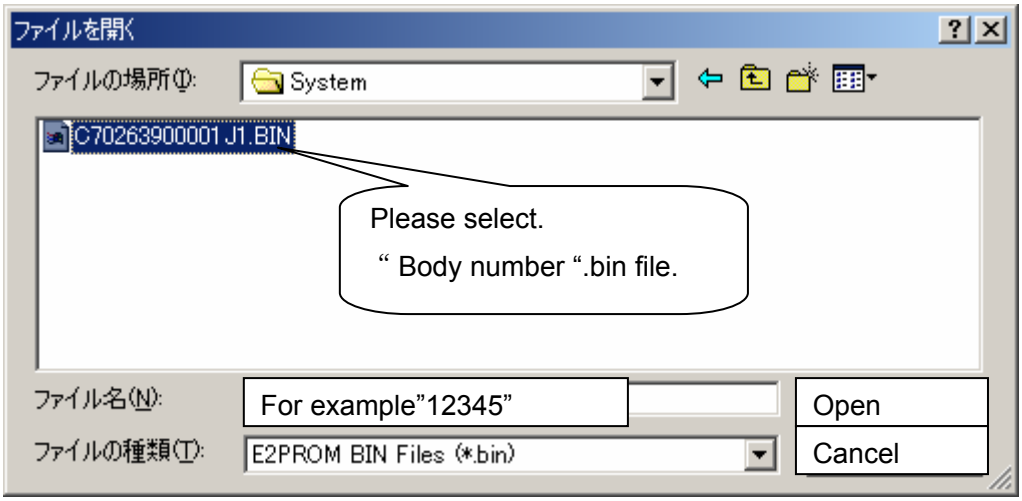


Fig. 2-2 Open Dialog Box

5. A message box to confirm the restore is displayed.　The E2PROM contents are displayed in the E2PROM Tool window.　If they are correct, click OK.

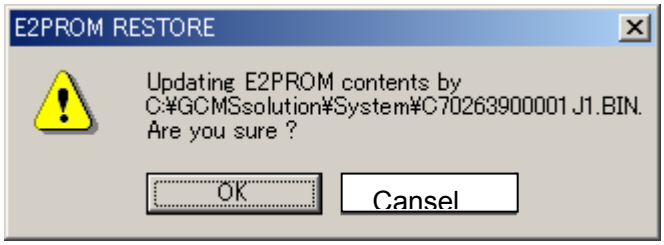


Fig. 2-3 Message Box to Confirm Restore

6. If the E2PROM is restored normally, close the window and reboot the instrument.

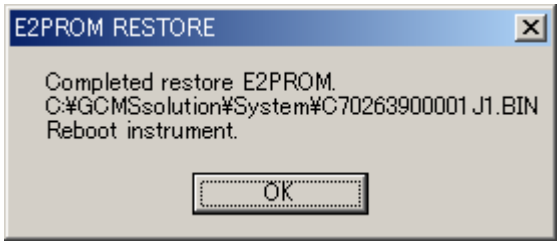


Fig. 2-4 Restore Complete Dialog Box

13. Adjusting the RF PS Assy

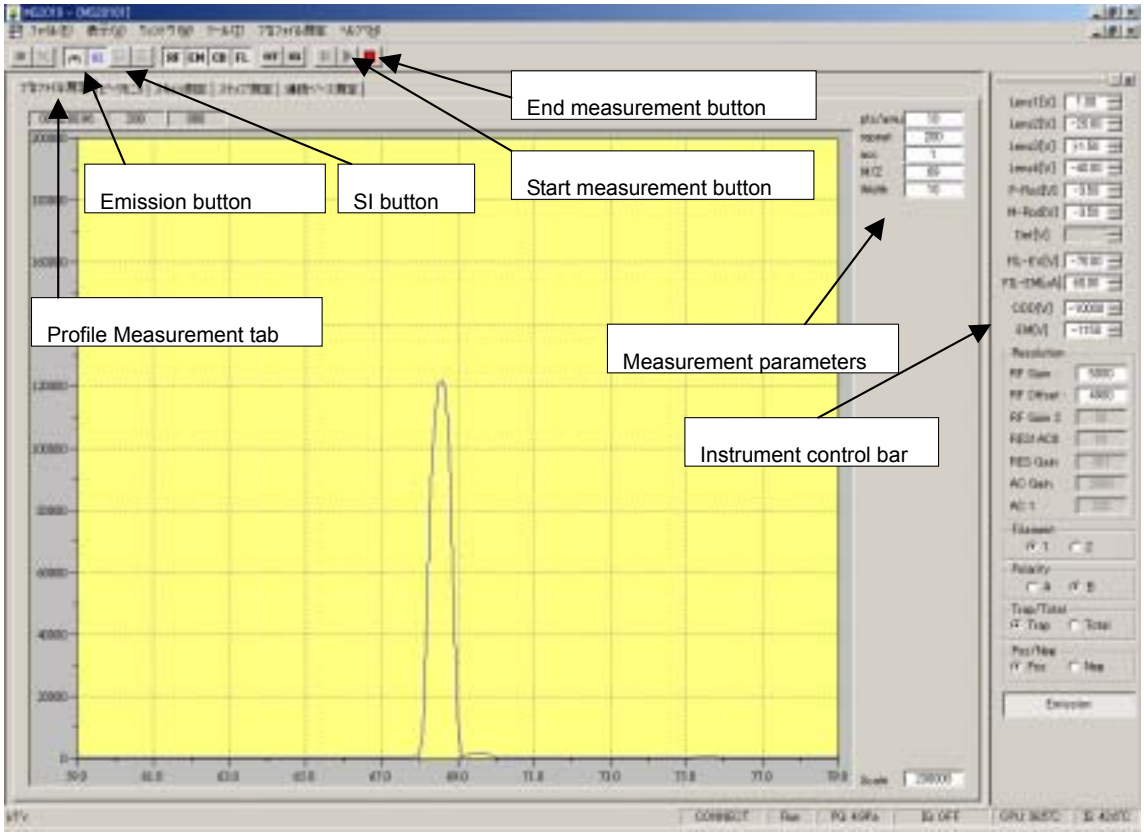
Preadjustment

1. Run MS2010.EXE. Select the Profile Measurement tab.
2. Click the CONNECT button on the tool bar.
3. Check RF power supply tuning

   Select "RF Tuning" from the Tools menu. The RF Tuning window opens. Set the mass number and click on the RF ON button. RF tuning is conducted to minimize the Value.
4. Set the following measurement parameters and press the start measurement button on the tool bar.

pts/amu	10	repeat	200
acc 1	M/Z	69	
width	10	Scale	200000
5. Press the tool bar SI button. Wait a few seconds, and then press the emission button.

6. On the instrument control bar, set RF Gain to 5000, RF Offset to 4900, and CDD to –10000 V. Select Filament 1, Polarity A.



7. Make coarse adjustment of the lens voltages (Lenses 1 to 4) to maximize the m/z=69 peak intensity. Adjust the detector voltage (EM) into the range 100000 to 200000.
8. Press the end measurement button when the adjustment is complete.

Adjustment of RF power-supply trimmers VR1 (RF) and VR2 (M/Z)

* Remove the rear cover before adjusting the RF power-supply trimmers.

1. Select "Adjust RF trimmers" from "Adjust Resolution" in the Tools menu.
2. The RF Power Supply Adjustment 1 window opens. (Fig. 2)
3. Press the Adjust button to display the m/z69, 100 peaks, peak full widths at half maximum (FWHM), and the peak m/z offsets in the RF Power Supply Adjustment 1 window.
4. Adjust VR1 (RF) and VR2 (M/Z) to set FWHM=0.6 and identical M/Z OFFSET values for each peak, as follows:
   4.1 Adjust VR1 until both FWHM values are identical.
   4.2 Use the RES set value to adjust the FWHM values to 0.6.
   4.3 Adjust VR2 until both M/Z OFFSET values are identical.
5. When the adjustments are complete, press the Adjust button to end measurements and close the window.

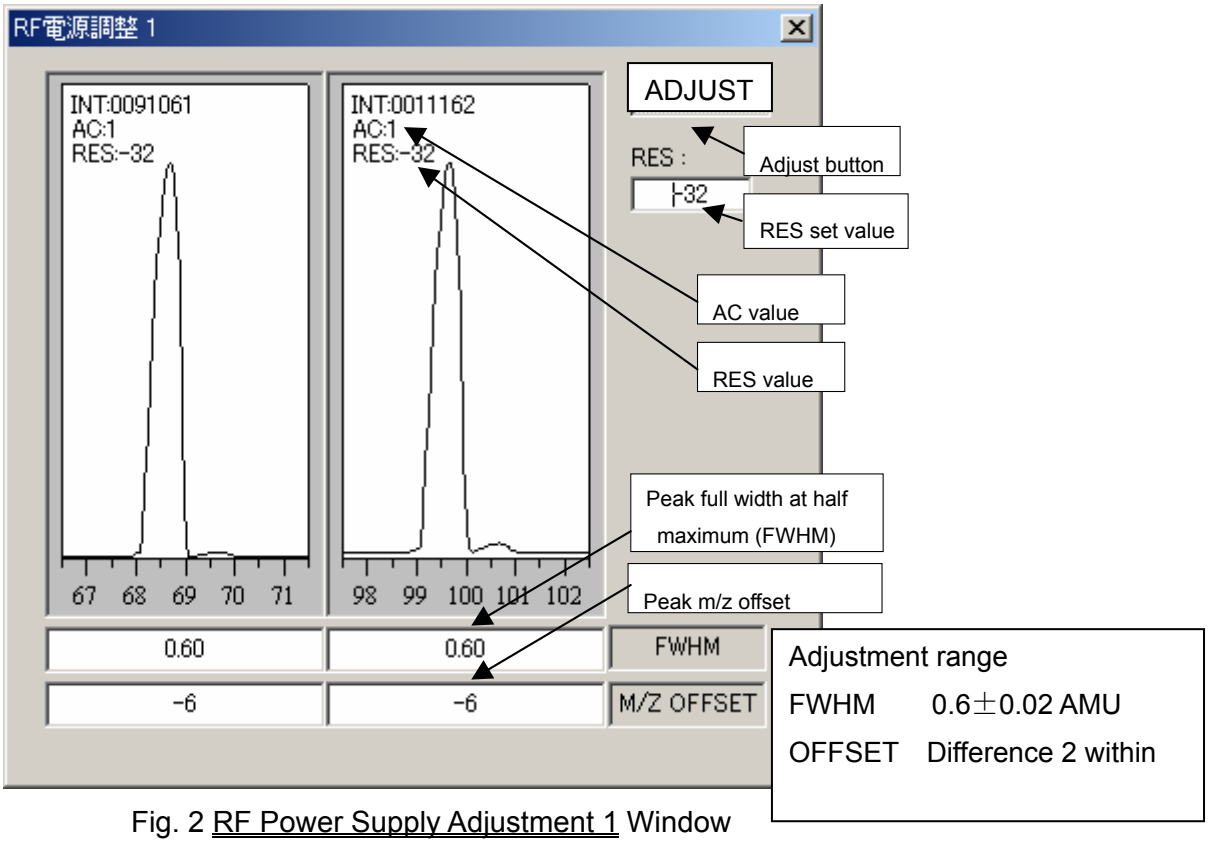


Fig. 2 RF Power Supply Adjustment 1 Window

AC (52.5kHz) Adjustment

1. Select "Adjust 52.5kHz" from "Adjust Resolution" in the Tools menu.
2. The RF Power Supply AC Adjustment window opens. (Fig. 3)

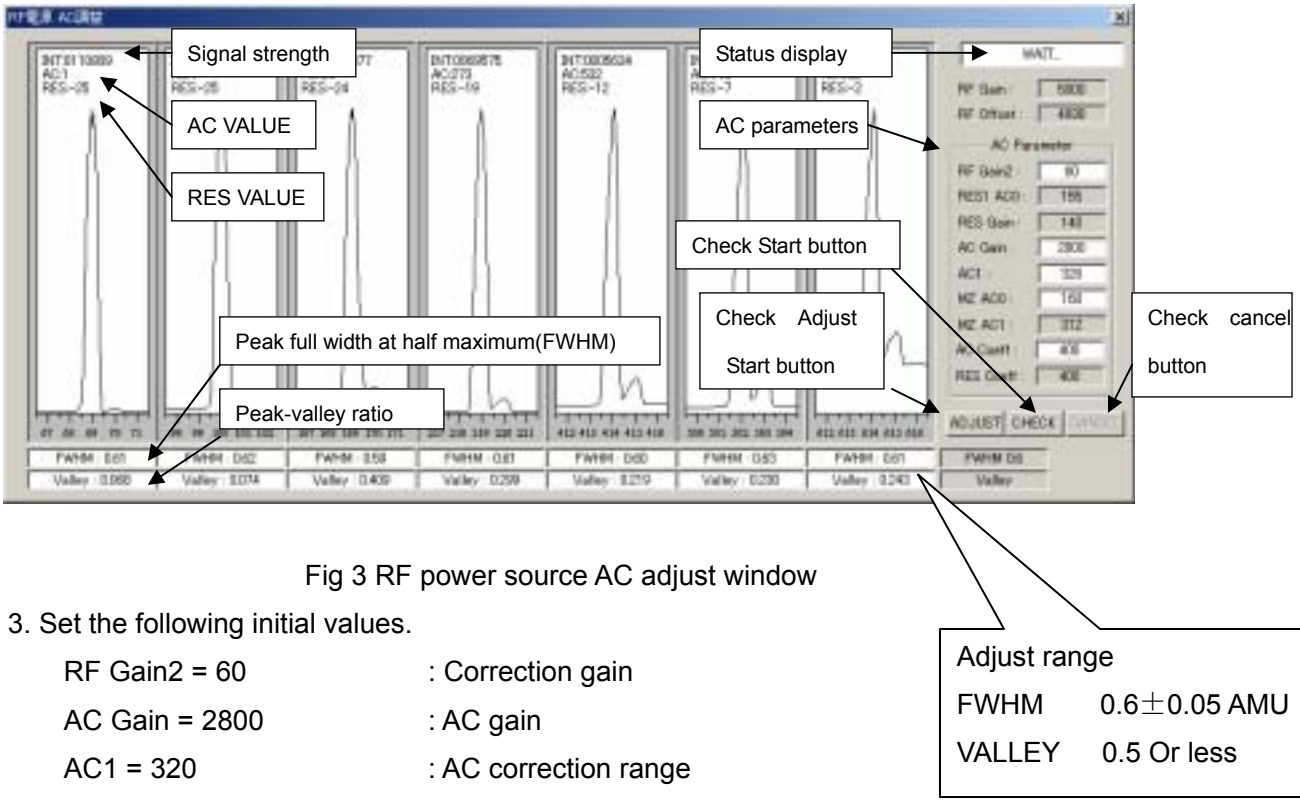


Fig 3 RF power source AC adjust window

3. Set the following initial values.

RF Gain2 = 60	: Correction gain
AC Gain = 2800	: AC gain
AC1 = 320	: AC correction range
MZ AC0 = 130	: Initial mass number when AC applied
AC Coeff = 400	: AC correction coefficient
RES Coeff = 200	: RES correction coefficient

3.1 RF Gain2

RF Gain2 is a parameter that corrects the AC application when the peak full width at half maximum (FWHM) is changed. Reducing RF Gain2 causes more frequent AC application when the peak resolution is increased. Normally, the initial value of 60 is left unchanged.

3.2 MZ AC0, AC Gain

AC must be applied linearly according to the mass number. The MZ AC0 parameter sets the mass number at which AC application starts at FWHM = 0.6. AC Gain is the gain parameter for AC.

3.3 RES Gain

The peaks normally become fatter when AC is applied. The RES Gain parameter corrects for this effect. It is set during auto-tuning and does not need to be adjusted.

3.4 AC1, AC Coeff, RES Coeff

Linear AC application is inadequate in the medium mass-number range when AC is first applied. These parameters correct for this effect.

This correction is conducted from the mass number indicated for MZ AC0 up to the value of AC1. The mass number at which AC becomes AC1 is displayed as MZ AC1.

AC Coeff and RES Coeff represent 100 times the order of the AC correction curve. A value of 100 represents a straight line.

4. Press the CHECK button to confirm the full width at half maximum (FWHM) for each peak and how AC is applied (peak separation and signal strength). At the start of this check, "CHECKING…" flashes green in the status display. The display reverts to "WAIT…" when the check is complete.

4.1 Checking the high mass-number range (414, 502, 614)

The high mass-number range is adjusted using MZ AC0 and AC Gain parameters. With insufficient AC, peak separation deteriorates and the Valley value increases, as shown in Fig. 4-1. Increase AC Gain to increase the amount of AC applied.

With excess AC, as shown in Fig. 4-2, the peak separation is good but the signal strength (sensitivity) deteriorates. In this case, decrease AC Gain as much as possible without decreasing the peak separation.

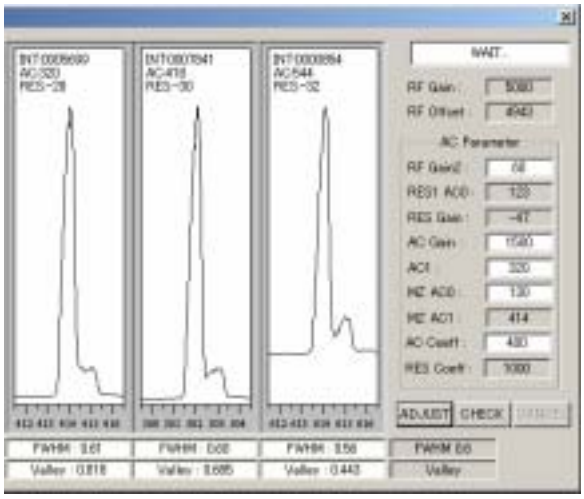


Fig. 4-1 Insufficient AC
Poor peak separation

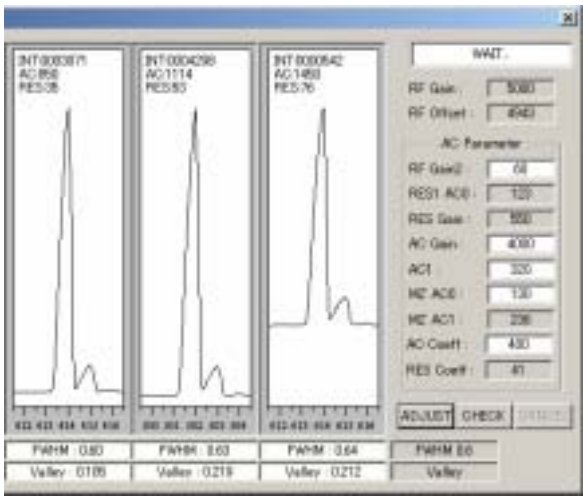


Fig. 4-2 Excess AC
Low signal strength

4.2 Checking the medium mass-number range (169, 219)

The medium mass-number range is adjusted using AC1, AC Coeff, and RES Coeff parameters.

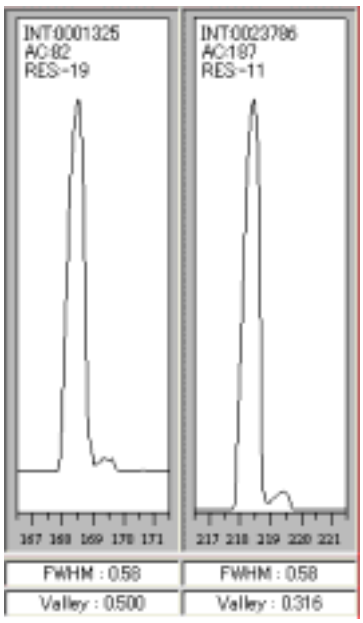


Fig. 4-3 Insufficient AC

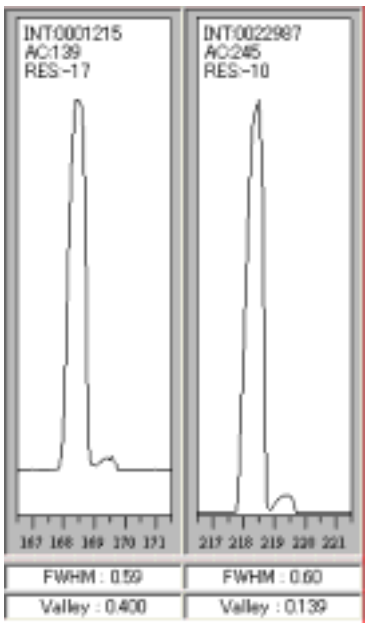


Fig. 4-4 Appropriate AC

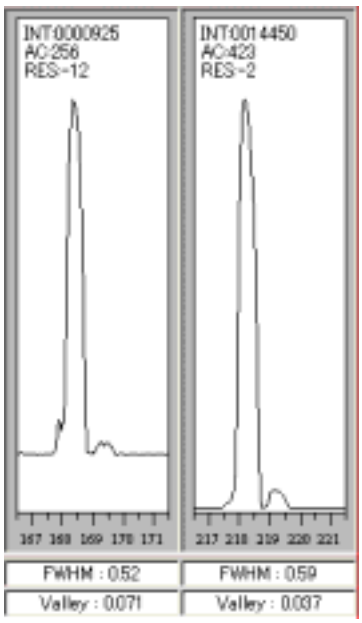


Fig. 4-5 Excess AC

At m/z 219 and 169, the peak separation of isotopes deteriorates with insufficient AC, as shown in Fig. 4-3. With excess AC, a ridge appears before the peak, as shown in Fig. 4-5, and signal strength (sensitivity) deteriorates. If the m/z169 peak width (FWHM) becomes too small, adjust it by decreasing RES Coeff.

The peaks appear as shown in Fig. 4-4 when the AC1, AC Coeff, and RES Gain parameters are adjusted correctly.

5. When the checks are complete, confirm that FWHM lies in the range 0.6 ±0.05AMU.

6. Close the window after the adjustments are complete.

7. The set values are automatically stored in the instrument EEPROM.

8. When the adjustments are complete, run GCMSsolution and conduct auto-tunig.

3. Troubleshooting

Problems when turning the power on
1. MS does not turn on
2. Abnormal Status LEDs
Problems when running software
3. Cannot connect to MS
4. Cannot connect to GC
Problems when starting evacuation
5. No ready status after automatic start
6. Pirani gauge, IC value too high, IG does not light
7. Loud noise
Problems during tuning
8. No peaks obtained
9. Ion-source temperature does not rise or rises too high
10. Error displayed after filament turns on

Problems when turning the power on

1. MS does not turn on

Check the power supply.

☐ Is the power supply voltage within the required range for the MS?

MS required voltage: 100V ± 10%

☐ Is the power cable connected correctly?

☐ Is the wiring correct?

Check the power switch.

☐ The power switch is on the instrument rear panel. Is it in the ON (1) position?

Hint

The power supply switch incorporates a no-fuse breaker (NFB) function.

The breaker is operating if the switch returns after being turned on (but it does not return fully). This indicates a problem in the power line of the MS main power unit.

–––>See section *4.4 Main Power Assy*.

Check the Status LEDs.

☐ Is the POWER LED lit yellow?

–––> If not, see section *4.4 Main Power Assy*.

Check the operation noise.

☐ Can the fan be heard?

–––> If not, see section *4.4 Main Power Assy*.

2. Abnormal Status LEDs

Check the status of the LEDs when the power is turned on.

☐ Do the POWER (yellow) and FAILURE (red) LEDs remain lit?

—> CPU is not operational. Check the CPU-A power supply.

Hint

This symptom appears in the following circumstances:

No 24V supply to the DC POWER PCB. (Check cables, connectors, MAIN POWER PCB.)

No ±15V supply to the CPU PCB. (Check CPU PCB voltage, cables, DC POWER PCB.)

No +5V supply to the CPU PCB. (Check CPU PCB voltage, cables, DC POWER PCB.)

☐ Do the POWER (yellow), READY (green), and FAILURE (red) LEDs remain lit?

—> Defective DRAM operation on CPU-A. Replace CPU-A.

☐ Yellow, green, and red change to yellow and red, but red remains lit?

—> Defective FPGA operation on CPU-A. Replace CPU-A.

Hint

The CPU-A runs a self-test when the power is turned on. The normal MS startup process is shown below.

① Power on
② Yellow, green, and red light (Green does not light if CPU is inoperative.)
③ Yellow and red light (DRAM check OK.)
④ Yellow lights (FPGA check OK.)

3. Cannot connect to MS

Check the MS power supply.

☐ Is the power switch turned ON (1)?

Hint

Connection with the PC is not established for about 15 seconds after the MS power is turned on.

Wait for a while after turning on the MS for it to connect to the PC.

Check the connector cable.

☐ Are the MS and PC connected correctly?

The MS and PC are connected together with an IEEE-1394 cable.

Check the device driver.

☐ Is the device driver registered in the Device Manager?

See section *4.10 PCB Assy, CPU-A* for details about how to check this.

4. Cannot connect to GC

Check the GC power supply.

☐ Is the GC power switch turned ON (1) ?

Check the connector cable.

☐ Are the MS and GC connected correctly?

The MS and GC are connected together with a 232C cable.

Check the GC communications parameters.

☐ Are the communications parameters set correctly?

The correct settings are LEVEL 3 and 57600.

Check the contents of the MS E2PROM.

☐ Are the E2PROM contents set correctly?

The correct settings are LEVEL 3 and 57600.

The E2PROM contents can be checked by running MS2010.EXE.

Problems when starting evacuation

5. No ready status after automatic start

Check the GC settings.

☐ Is an appropriate carrier gas pressure set at the GC?

An inappropriate carrier gas supply can result in no pressure increase at the column inlet, so that the automatic startup sequence does not begin (and the rotary pump does not operate). Check that the set carrier gas conditions are suitable for the column.

Check the rotary pump.

☐ Is the rotary pump rotating?

If not, check the wiring.

If the wiring is correct, see section *4.4 Main Power Assy*.

Check for leaks.

☐ Is the unit front door completely closed?

Occasionally, dust can cause minute leaks. Check that no dust is sticking to the O-ring contact faces before closing the front door.

☐ Is there any leakage from the interface column connector?

Leakage can occur from the interface unit after repeated analysis with heating. Tighten the connector slightly (about 1/6 turn).

Caution: Fully tightening the connector with the wrench supplied could damage the screw threads. If slight re-tightening does not stop the leakage, replace the ferrule.

☐ Is the column broken?

It is impossible to maintain a vacuum if the column breaks near the interface unit. If the column is scratched during maintenance, it tends to break at the scratch.

☐ If the analysis tube was opened during maintenance, is there any leakage from it?

If a normal vacuum could be maintained before maintenance but not after it, initially check the positions where maintenance work were conducted and the interface column connector (the temperature has been dropped).

Hint

It is sometimes possible to identify very large leaks by turning off the GC and MS and listening for them.

5. No ready status after automatic start (cont.)

Check PG.

☐ Does the PG value fluctuate?

The turbo molecular pump (TMP) does start above 300kPa.

If no leaks exist, the PG could be defective. See section *4.6 PCB Assy, Main CTRL-A*.

A discontinuity in the PG wiring causes an error message to be display and prevents startup.

Check the TMP.

☐ Is the TMP running?

A problem could exist in the MAIN POWER PCB or cable if the TMP does not run although PG is less than 300Pa. –––> See section *4.4 Main Power Assy*.

☐ Has a TMP power supply error occurred?

The status LEDs can be seen by removing the sheet metal between the GC and MS. If an error is displayed for TMP power supply, this indicates a problem with the TMP or TMP power supply. Replace one of these and check the condition again.

Caution

The power supplies for the large TMP and small TMP are incompatible in early GCMS-QP2010 models. Never swap the wiring for testing purposes or normal operation will not be subsequently possible.

Hint

Evacuation system protective operations

(1) Start

Does the flow become READY within 3 minutes? No –––> error

(2) RP ON

Does the Pirani gauge drop below 300Pa within 5 minutes of turning on the rotary pump (RP)? No –––> error

(3) TMP ON

Does the Pirani gauge drop below 100Pa within 5 minutes of turning on the turbo molecular pump (TMP)? No –-> error

Does TMP become READY within 5 minutes? No –> error

(4) Vacuum READY 30 seconds after both TMP become READY

The FAILURE status LED flashes red if evacuation stops automatically for protection.

TMP and RP failures

Within warranty period: Contact the Quality Assurance Department or TS.

Outside warranty period: Repaired by service company (at a fee).

Problems when starting evacuation

6. Pirani gauge, IC value too high, IG does not light

Check the column flow rate.

☐ Is the column flow rate within the recommended range?

At a column flow rate of approximately 2mL/minute, the Pirani gauge value is about 40Pa or lower at the start of evacuation and about 1 to 10Pa after one day.

The normal IG gauge value after one day is no more than 1 to $2E^{-3}$Pa.

(See Appendix E in the System User Guide.)

Check the N_2 (m/z28) and O_2 (m/z32) values.

☐ If these values are larger than the m/z18 value

Check for looseness in the column connector and for damage to the input septum or column.

Check the carrier gas piping.

Thoroughly purge the piping when GC/MS has been newly installed.

(After purging at the GC connector for several minutes, turn on the GC power, set the purge flow and total flow to maximum, and leave for 10 or 20 minutes.)

Follow the vacuum-leak check procedures in the System User Guide to identify vacuum leak positions.

Check IG.

☐ Is the IG filament burned out?

An error is displayed if the IG filament is burned out.

☐ Is the connector wired correctly?

Refer to sections *4.6 PCB Assy, MAIN CTRL-A* and *4.9 PCB Assy, IC CTRL-A* when checking the IG control.

7. Loud noise

Check the source of the noise.

☐ Source is RP?

Oil deteriorated, worn rotor –> Replace oil, overhaul

☐ Source is TMP1?

Defective bearing, wear, damaged blades ––> Replace TMP.

☐ Source is TMP2?

Defective bearing, wear, damaged blades ––> Replace TMP.

Hint

To determine between a noise source in TMP1 and TMP2, turn on just one of them.

A tool program is needed to turn the turbo molecular pumps on and off individually.

Problems during tuning

8. No peaks obtained (peaks extremely small)

Check the tuning file.

☐ Are the lens voltage values appropriate?

Revert the lens voltages to the default values if unclear whether the tuning values are appropriate.

The default values are as follows:

L1 1.0V / L2 -20V / L3 -1.5V / L4 -40V / P-Rod -3.5V / M-Rod -3.5V / FIL-EV -70V / FIL-EM 60V / CDD -10000V / EM -900 ~ -1200V

Check the introduction of PFTBA.

☐ Is the PFTBA volume appropriate?

Approximately 5mm from the bottom is appropriate.

☐ Is the sound of the PFTBA valve opening and closing audible?

If no sound of valve operation is audible –-> Check MAIN CTRL-A.

Check the lens voltage.

☐ Is each lens voltage output correct?

If any trace of peaks is apparent, set each voltage individually to 0V and check for changes to the peak height. If absolutely no peaks are visible, measure the voltages at the checkpoints on MAIN CTRL-A.

Check the degree of vacuum.

☐ Is the IG value within the normal range?

A value not exceeding 1 to $2E^{-3}$Pa is normal.

☐ Appropriate GC column flow rate?

☐ Large air components (m/z28, m/z32)?

See 6. Pirani gauge, IC value too high, IG does not light.

8. No peaks obtained (peaks extremely small) (cont.)

Check the ion source.

☐ Is the ion source correctly installed?

Check if the ion source was distorted during installation.

☐ Is any foreign matter inside the ion source?

Check inside the ion source for foreign matter, such as fragments of broken column.

☐ Is the column length appropriate?

Normal ionization is not possible if the column is inserted too far into the ion source.

Check the RF power supply.

☐ Are the RF GAIN and RF OFFSET values appropriate?

If no peaks are obtained, reduce the RF OFFSET value to about 4000.

This reduces the resolution but makes peaks easier to detect.

☐ Is the RF power supply operating normally?

See section *4.11 RF PS Assy* for details about how to check the RF power supply operation.

Check the signal detection.

☐ Does a small amount of noise appear in the peak monitor window when the preamplifier is

tapped?

View the peak monitor at 999x zoom.

If no noise appears, check the detector wiring and the connections between the preamplifier and CPU-A.

☐ Does the baseline fluctuate in the peak monitor window when the filament turns on?

View the peak monitor at 999x zoom. If no baseline fluctuation appears, check

MAIN CTRL-A.

A variety of causes could lead to lack of signal output or small signals. If the problem is not resolved by the checks above, check each electrical unit in the sequence below.

Vacuum system	Low degree of vacuum can lead to poor peak strength and unfamiliar peaks may appear.
Filament	In principle, defective control causes an error display. Check the voltage settings.
Ion source	Defective insulation, defective assembly, or defective installation can result in no peaks.
Lenses	Defective electrical system or incorrect connection can result in no peaks.
Rods, RF source	Incorrect wiring or a defective electrical system can result in no peaks.
CDD	Incorrect wiring or a defective electrical system can result in almost no peaks.
EM	Incorrect wiring or a defective electrical system can result in no peaks.
Signal system	Incorrect wiring or a defective electrical system results in no response to vibrations.

9. Ion-source temperature does not rise or rises too high

Check the heater switch.

☐ Is the heater switch in the ON position?

The heater switch automatically turns on during automatic startup. If the CPU determines that the heater switch is ON but the temperature is not rising, an error message is displayed and the switch automatically turns OFF. Check the following items if this occurs.

The heater switch automatically turns OFF also when the temperature rises too high. Also check the following items in this case.

If the heater switch was not ON during manual startup, turn ON the heater switch.

Check the temperature parameter.

☐ Is the temperature control parameter correct?

The temperature control parameter is preset at the factory. The value should not normally be changed. A normal IS??? parameter value should not be zero or greater than four digits. If you are concerned about this parameter setting, use the E2PROM restore procedure to revert the parameters to the backed-up status.

See *Writing the E2PROM* for details.

Check the ion source.

☐ Conductivity of the heater?

☐ Is the heater firmly fixed to the block?

☐ Conductivity of the platinum sensor?

☐ Is the platinum sensor firmly fixed to the block?

☐ Is the box firmly fixed to the block?

Caution

The screws at the left must be tightened first when mounting the ion source.

The ion source cannot be correctly attached to the box if the screws at the right are tightened first.

☐ Is the wiring in contact with other wiring or panels?

Check the electrical circuits.

☐ Is the IS CTRL-A temperature control circuit functioning correctly?

See section *4.7 IS CTRL-A Assy*.

10. Error displayed after filament turns on

Display shows (090D) Trap/Total Current Low or (0D9C) Trap/Total Current Low.

- ☐ Are the filaments mounted correctly?

  Both filaments must be mounted correctly.
- ☐ Do the PC settings match the actual ion source installed?
- ☐ Is the ionization voltage sufficient for the emission current?

  Refer to the System User Guide for the normal set range.
- ☐ Are the filaments free of defects?
- ☐ Is the column installed at the correct length?

Display shows (090F) High-voltage Power Supply Error, (0D9E) High-voltage Power Supply Error Occurred, or (0DB2) Conversion Dynode Power Supply Error.

- ☐ Is the detector wiring correctly connected?
- ☐ Is the high-voltage power supply functioning normally?

  See section *4.6 PCB Assy, Main CTRL-A*.

Display shows (090E) High-frequency Power Supply Error.

- ☐ Is the rod wiring correctly connected?
- ☐ Has tuning been conducted correctly?
- ☐ Is the RF power supply functioning normally?

  See section 4.11 RF PS Assy.

Display shows (0DA0) Too Many Ions Entered Detector.

- ☐ Is the detector voltage set correctly?

Display shows (0DAD) Filament 1 Burned Out or (0DAE) Filament 2 Burned Out.

- ☐ Conductivity of the filament?
- ☐ Check the operation of IS CTRL-A.

  Caution

  Incorrect mounting of the filament can dramatically reduce the filament life.

  Always mount both filaments 1 and 2

4. Details of Electrical Circuits

Wiring Diagrams

1. Wiring diagram (Overall)
2. Wiring diagram (MAIN POWER ASSY)
3. Wiring diagram (Details)

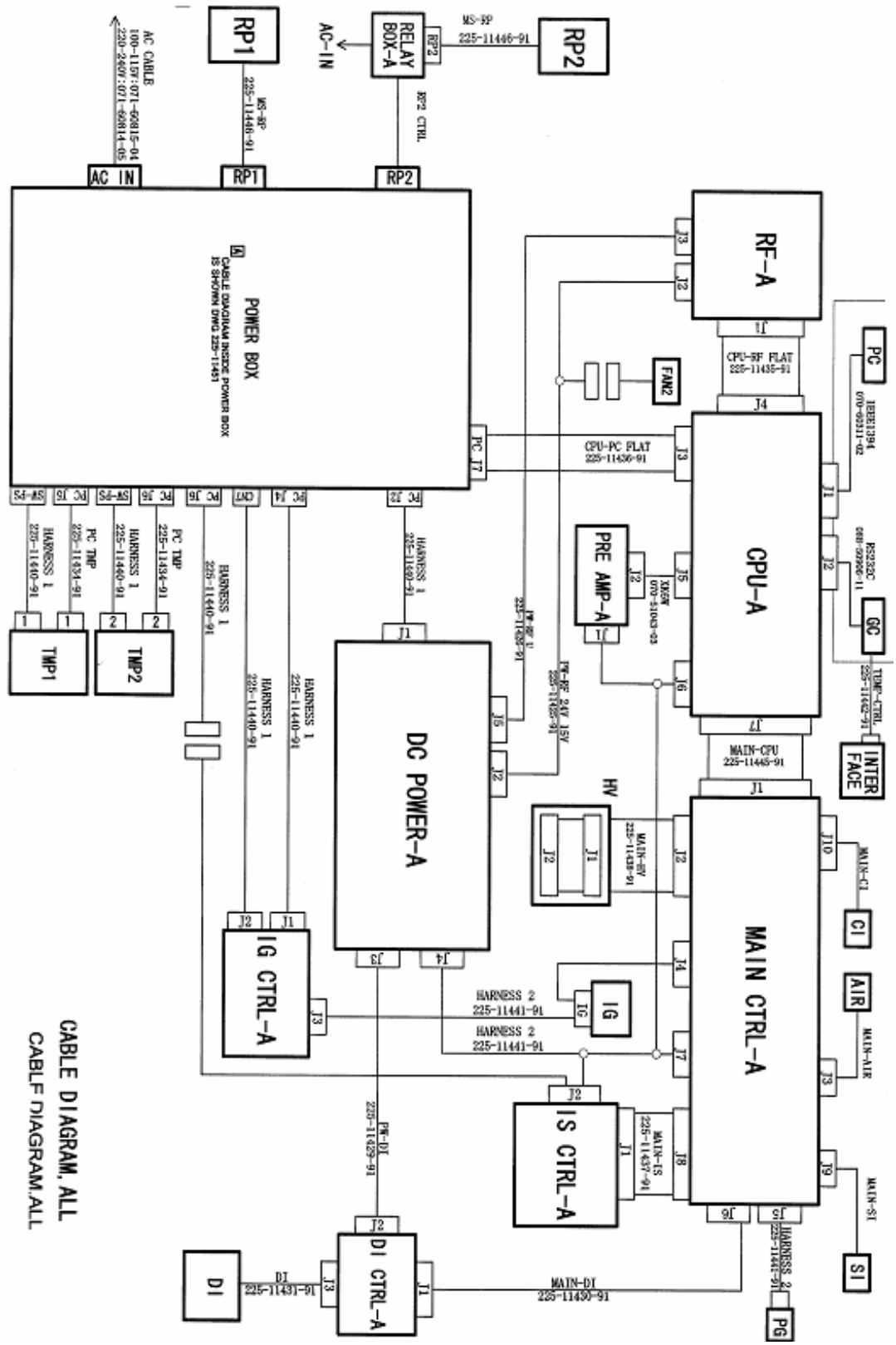
Unit Operation Checks

4. MAIN POWER ASSY
5. DC POWER-A
6. PCB ASSY, MAIN CTRL-A
7. IS CTRL-A ASSY
8. HV PCB ASSY
9. PCB ASSY, IG CTRL-A
10. PCB ASSY, CPU-A
11. RF PS ASSY
12. PCB ASSY DI CYRL-A
13. RELAY BOX-A

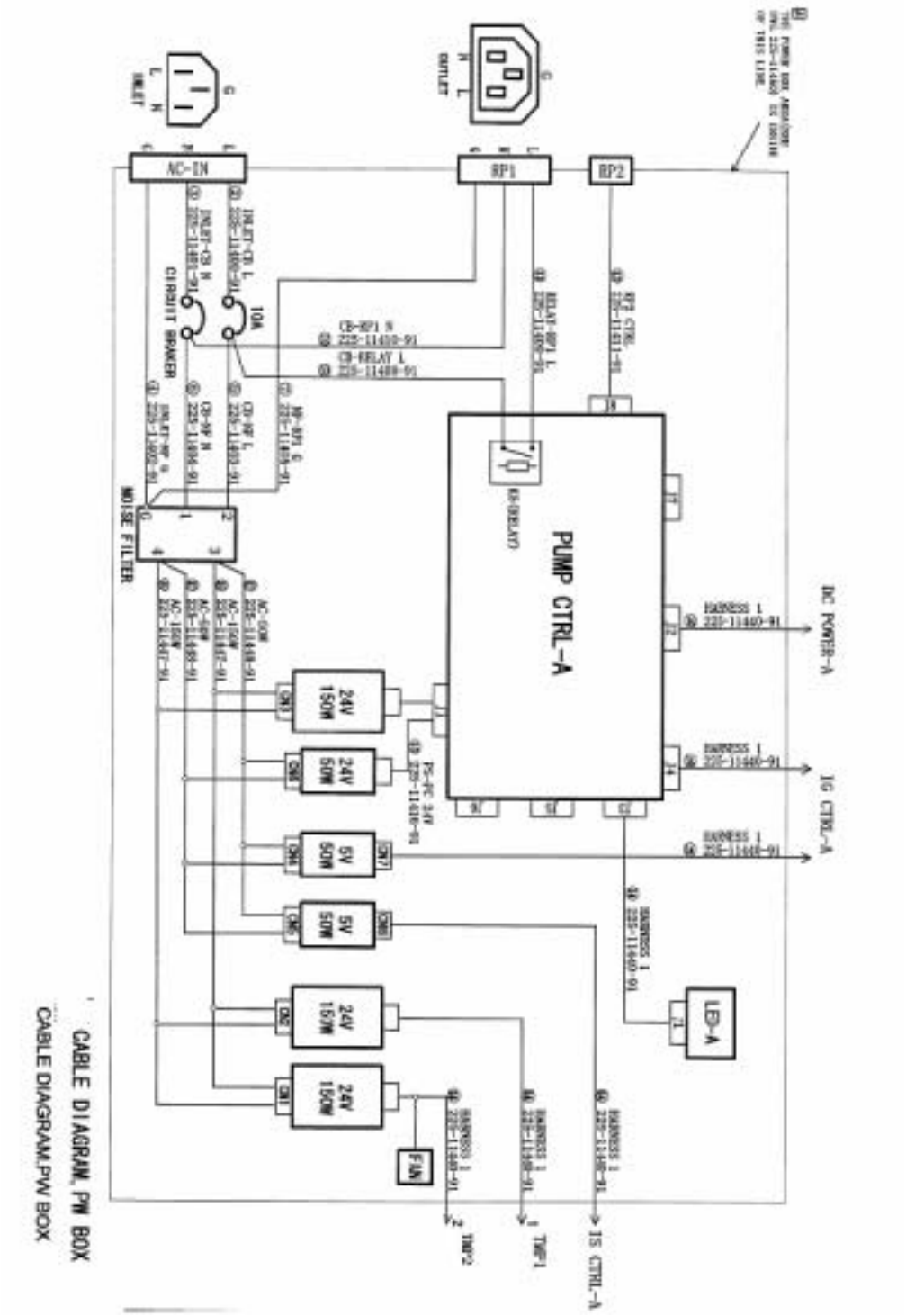
Wiring Diagrams

1. Wiring diagram (Overall)

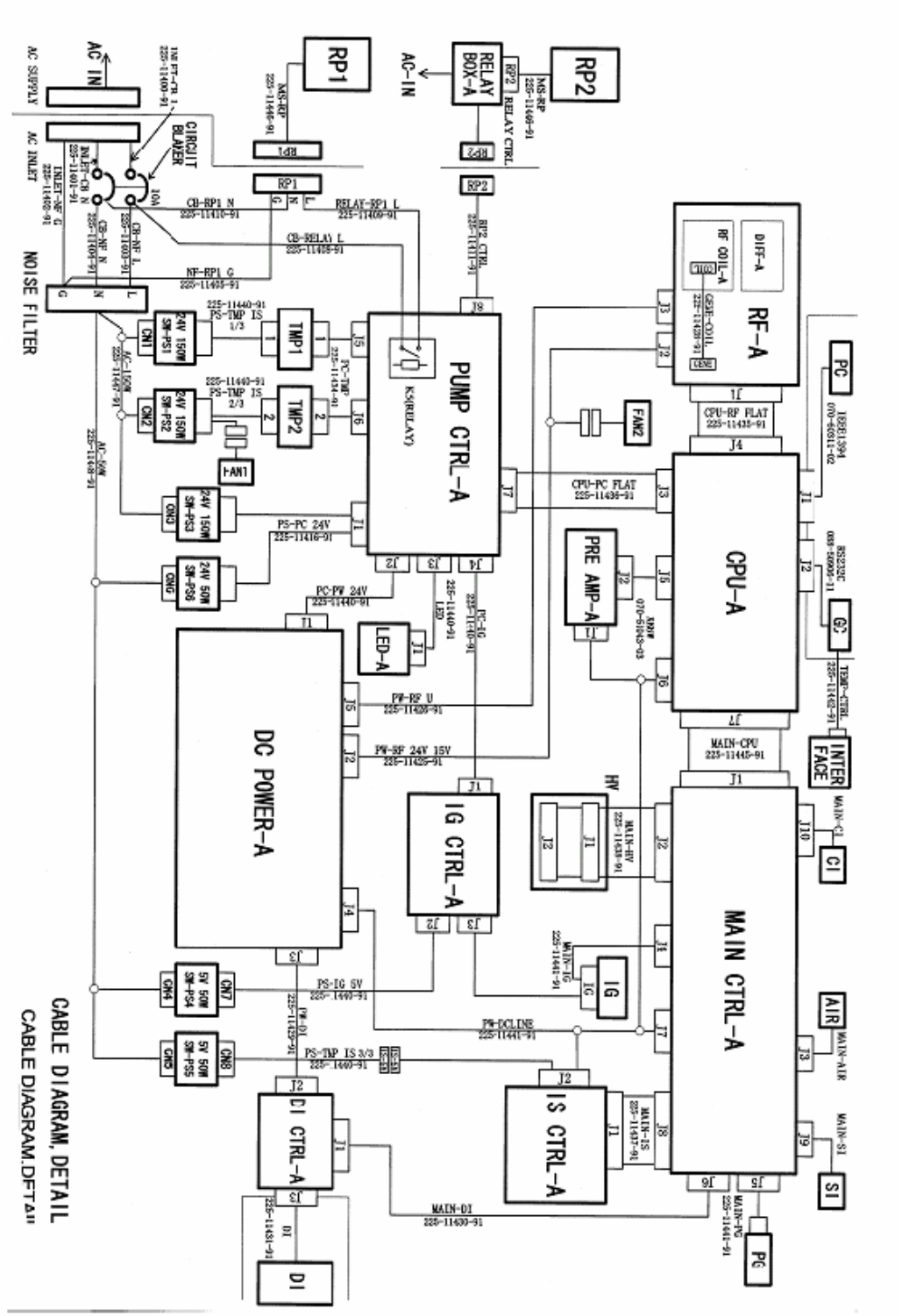
Wiring Diagrams



2. Wiring diagram (MAIN POWER ASSY)



3.Wiring diagram (Details)



4. MAIN POWER ASSY

Outline

The MAIN POWER ASSY uses switching power supplies to convert the supply voltage (100 to 240VAC) into the various supply voltages: DC POWER-A (±24V), IG CTRL-A (+5V), and IS CTRL-A (+5V). It incorporates a PCB that provides ON/OFF control of the rotary pumps and turbo molecular pumps.

Operation Check Method

If an abnormality occurs, follow the procedure below to check the operation of the MAIN POWER ASSY to efficiently diagnose the problem.

Caution

A voltage of 100 to 240VAC is supplied to the MAIN POWER ASSY. To avoid electric shocks or damage to the assembly, touch only the points instructed.

1. Checking the supply voltage

First, check that the power switch is in the OFF position. Disconnect the MAIN POWER ASSY cable connectors (Connectors ① to ⑧ in the diagram) from the boards supplied or from MAIN POWER. Turn ON the power switch and measure the voltage at each connector on the power line, as follows:

TMP1: Measure the voltage at Pin 1 of Connector ① in the block diagram, relative to Pin 2.
(normal range: +22.7 to +25.3VDC)

TMP2: Measure the voltage at Pin 1 of Connector ② in the block diagram, relative to Pin 2.
(normal range: +22.7 to +25.3VDC)

IS CTRL-A: Measure the voltage at Pin 3 of Connector ③ in the block diagram, relative to Pin 1.
(normal range: +4.8 to +5.3VDC)

IG CTRL-A: Measure the voltage at Pin 3 of Connector ④ in the block diagram, relative to Pin 1.
(normal range: +4.8 to +5.3VDC)

DC POWER-A: Measure the voltage at Pin 1 of Connector ⑤ in the block diagram, relative to Pin 3.
(normal range: +22.7 to +25.3VDC)

Measure the voltage at Pin 5 of Connector ⑤ in the block diagram, relative to Pin 3.
(normal range: -22.7 to -25.3VDC)

If any abnormality is discovered in these voltages, check the switching power supply and check the conductivity of the cable connections.

2. Checking the rotary pump (RP) ON/OFF control

Check RP1 and RP2 control using GCMSsolution.

Stop RP1 and RP2 using GCMSsolution. Disconnect the RP1 cable and RP2 cable from the rear of the GCMS-QP2010. Measure the AC voltage across L and N of the RP1 outlet at the rear of the GCMS-QP2010 to confirm that the voltage is 0V. Then, turn on RP1 and again measure the voltage across L and N of the RP1 outlet to confirm that it is equal to the instrument supply voltage.

Next, check RP2. Measure the resistance across Pins 1 and 2 of the RP2 outlet to confirm that they are insulated. Then, turn on RP2 and measure the resistance again to confirm that the resistance does not exceed 5Ω.

If any abnormality is discovered in these checks and the MAIN POWER ASSY wiring is normal, replace PUMP CTRL-A (225-11350-91).

3. Checking turbo molecular pump (TMP) ON/OFF control and the READY signal

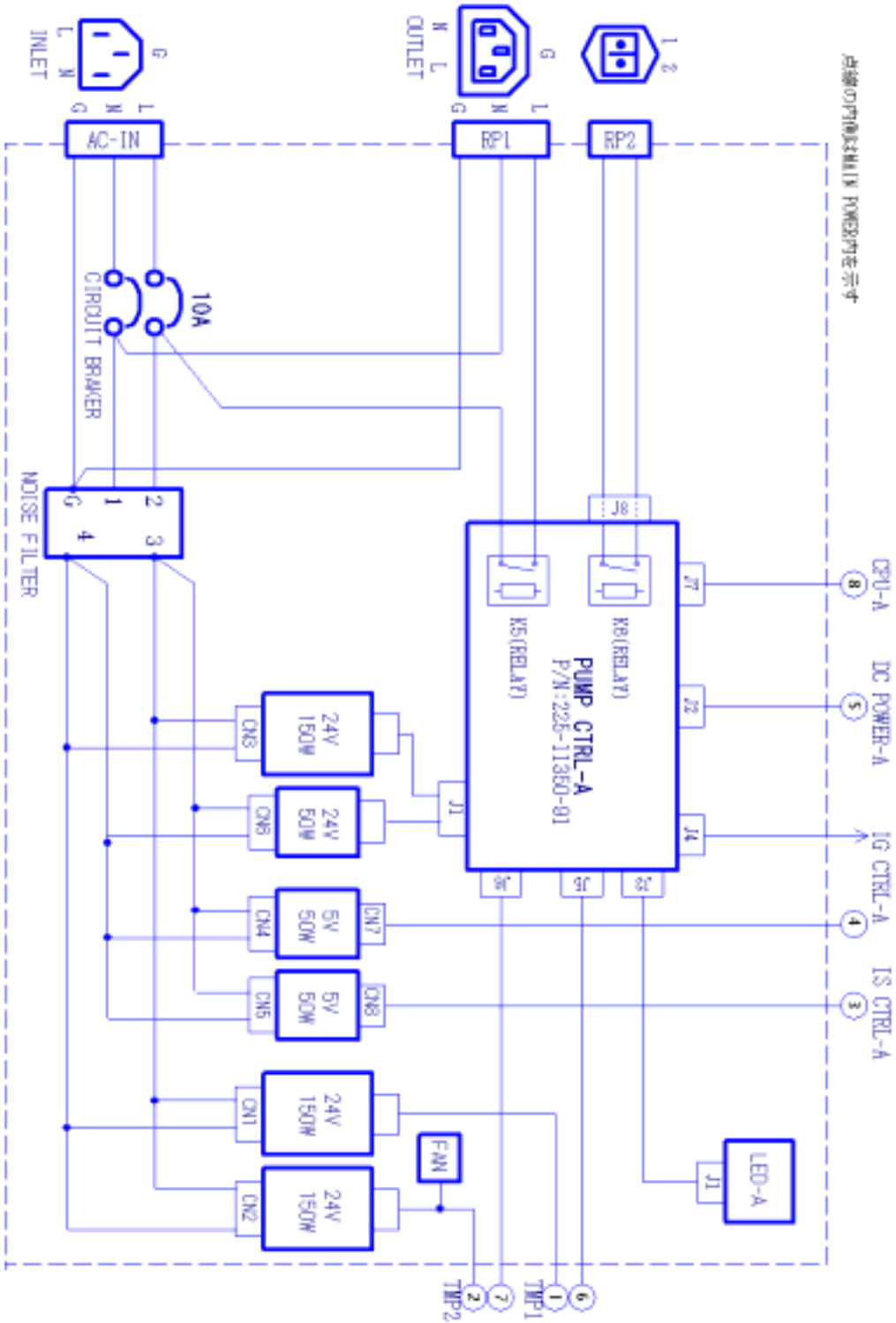
Check TMP1 and TMP2 control using GCMSsolution.

Stop the evacuation system, disconnect connectors ⑥ and ⑦ from TURBO DRIVE.S (TW300) and TURBO DRIVE.S (TW70H), and conduct automatic startup. Check with GCMSsolution that TMP 1 and TMP2 are on. Measure the resistance across Pins 1 and 2 of the Connectors ⑥ and ⑦ outlet to confirm that the resistance does not exceed 10Ω. A resistance greater than 10Ω suggests a problem in a cable or in the PUMP-CTRL PCB (225-11350-91).

Turn off TMP 1 and TMP2 using GCMSsolution and re-connect the connectors to their correct positions. Now, turn on TMP 1 and TMP2 again using GCMSsolution and confirm that the TURBO DRIVE.S green READY LED light continuously. (Flashing indicates not ready.) The TURBO DRIVE.S green READY LED lit continuously but the GCMSsolution indicating TURBO PUMP is NOT-READY suggests a problem in a cable (⑥, ⑦, ⑧) or in the PUMP-CTRL PCB (225-11350-91).

MAIN POWER ASSY Block Diagram

Parts inside the broken box are in the MAIN POWER ASSY.



5. DC POWER-A

Outline

DC POWER-A generates DC voltages for supply to CPU-A, PRE AMP-A, MAIN CTRL-A, IS CTRL-A, RF GENE-A and DI CTRL-A.

Operation Check Method

If an abnormality occurs, follow the procedures below to check the operation of the DC POWER-A PCB to efficiently diagnose the problem.

Caution

A voltage of 500VAC is supplied to the PCB. To avoid electric shocks or damage to the assembly, touch only the points instructed.

1. Checking the voltage supplied by the MAIN POWER ASSY

Check the voltages supplied by the MAIN POWER ASSY. The voltages are as follows, when the chassis is grounded:

CP12 +24V (normal range: +22.7 to +25.3VDC)

CP14 -24V (normal range: -22.7 to -25.3VDC)

Abnormal supply voltages are probably due to a defective MAIN POWER ASSY. Check the MAIN POWER ASSY.

2. Checking the voltages generated by DC POWER-A.

The voltages are as follows, when the chassis is grounded:

CP1 -500V (normal range: -510 to -580VDC)

CP3 +500V (normal range: +510 to +580VDC)

CP4 +15V (normal range: +14.25 to +15.75VDC)

CP6 -15V (normal range: -14.25 to -15.75VDC)

CP7 +5V (normal range: +4.8 to +5.3VDC)

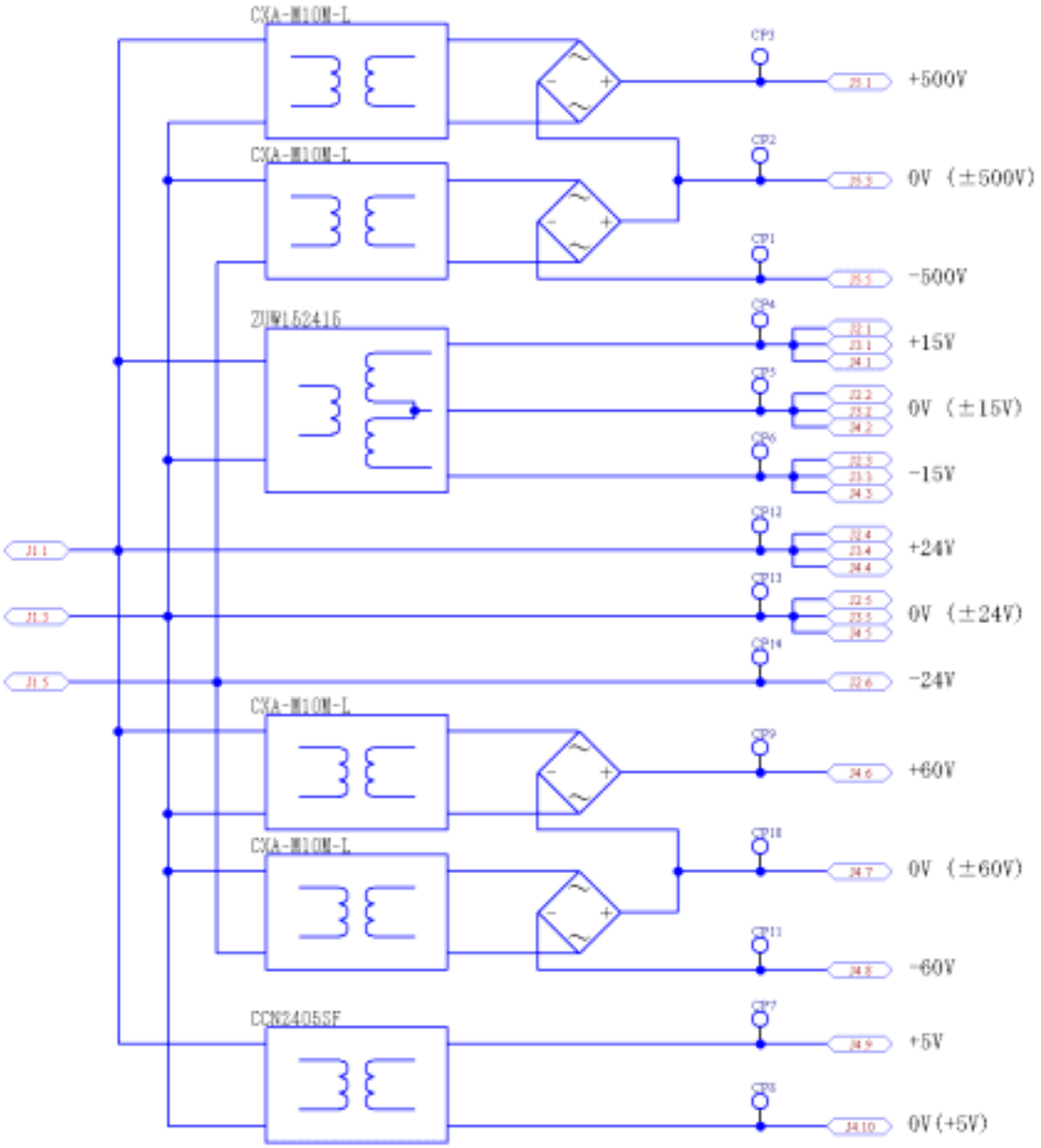
CP9 +60V (normal range: +57 to +68VDC)

CP11 -60V (normal range: -57 to -68VDC)

If the voltages above are not output, disconnect the connectors from J2 to J5, and repeat the

voltage check. If the output voltages are still not normal, the DC POWER PCB is probably defective. Replace the DC POWER PCB. Conversely, if the voltages become correct after the connectors are disconnected, the problem is probably in the cable supplying the voltage or in the PCB receiving the voltage supply. Check the cable and PCB receiving the supply.

DC POWER-A Block Diagram



6. PCB ASSY, MAIN CTRL-A

Outline

MAIN CTRL-A generates the lens voltages, controls the solenoid valves, controls the high-voltage supply, measures the vacuum with the Pirani gauge, and provides voltage amplification functions for vacuum measurement using IG. It also functions as a relay board between CPU-A and IS CTRL-A and DI CTRL-A.

Operation Check Method

If an abnormality occurs, follow the procedures below to check the operation of the MAIN CTRL-A PCB to efficiently diagnose the problem.

Peak abnormality: Checks 1, 2, 3

Vacuum abnormality: 1, 4, 5

Caution

A voltage of ⊏60VDC is supplied to the PCB. To avoid electric shocks or damage to the assembly, touch only the points instructed.

1. Checking the supply voltages

Check the supply voltages. The supply voltages are as follows, when the chassis is grounded:

CP10 +15V (normal range: +14.25 to +15.75VDC)

CP13 -15V (normal range: -14.25 to -15.75VDC)

CP14 +24V (normal range: +22.7 to +25.3VDC)

CP29 +60V (normal range: +57 to +68VDC)

CP32 -60V (normal range: -57 to -68VDC)

2. Checking the lens voltages

Set the lens voltages with the Peak Monitor and confirm the output voltages at the check pin. The normal output voltage lies in the range: set voltage ±5%.

CP16 LENS1 output voltage

CP30 LENS 2 output voltage

CP18 LENS 3 output voltage

CP31 LENS 4 output voltage

If the output voltages differ from the set voltages, check if the D/A voltages supplied from the CPU PCB are correct.

CP23 = set voltage/1.5

CP26 = set voltage/5

CP24 = set voltage/1.5

CP25 = set voltage/5

Abnormal D/A voltages suggest a defective CPU PCB.

If the D/A voltages are normal but the output voltages are incorrect, conduct the following checks to determine if the problem is caused by an abnormality in the lens voltage generation circuits or by an abnormality in the vacuum vessel.

Turn off the power and disconnect the MAIN CTRL-A connector J8 to break the connection with IS CTRL-A. Turn the power back on and repeat the lens output voltage check.

If the lens output voltages differ from the set voltages, the lens voltage generation circuits are defective and the MAIN CTRL-A PCB should be replaced.

If the lens output voltages are the same as the set voltages, the lens wiring is probably touching the inside of the vacuum vessel. Open the door and check.

3. Checking the high-voltage power supply control circuits

EM HV circuits (-0.5 to -3kV)

Set the detector voltage and check the voltages at both CP4[V-EM] and CP2[FB-EM].

V_{CP4} should be 3 x detector voltage setting (kV). Any abnormality in this voltage is probably due to incorrect D/A voltage from the CPU PCB.

Check that when EM HV is ON, V_{CP2}=V_{CP4}; when EM HV is OFF, V_{CP2} . 0V.

If the V_{CP2} voltage is generated whether EM HV is ON or OFF, this suggests a defective controller operational amplifier. Replace the MAIN CTRL PCB.

If V_{CP2} = 0V when EM HV is ON, the problem is probably in the high-voltage power supply assy, or in the connector cables.

CD HV circuits (-1kV to -10kV power supply)

Check the mode.

The D9 photodiode lights green in the EI mode.

If the D9 photodiode lights red or does not light, the MAIN CTRL-A PCB is probably defective.

Check the voltages.

Set the conversion dynode voltage and check the voltages at both CP3[V-CD] and CP1[FB-CD].

V_{CP3} should be 1 x conversion dynode setting (kV). Any abnormality in this voltage is probably due to incorrect D/A voltage from the CPU PCB.

Check that when CD HV is ON, V_{CP3}=V_{CP1}; when CD HV is OFF, V_{CP1} 0V.

If the V_{CP1} voltage is generated whether CD HV is ON or OFF, this suggests a defective controller operational amplifier. Replace the MAIN CTRL PCB.

If V_{CP1} = 0V when CD HV is ON, the problem is probably in the high-voltage power supply assy, or in the connector cables.

4. Checking the Pirani gauge measurement control circuits

Check the operational amplifier power supply voltage.

CP9 +5V

Confirm that circuit output voltage is in the correct range.

CP8 0.47 to 2.84V (1 to 300Pa) (Voltage decreases as the pressure increases.)

CP8 0.07V max. Discontinuity in Pirani gauge.

Check the Pirani gauge resistance.

Disconnect the Pirani gauge cable from the MAIN CTRL-A PCB connector J5 and measure the resistance between Pins 1 and 2. The normal resistance is 10 to 15Ω.

5. Checking the ion-gauge vacuum measurement circuit

If measurements seem incorrect, check the output from the ion-gauge collector current amplifier circuit.

CP6 [IG1]

A degree of vacuum in the range $1.3x10^{-3}$ to$1.3x10^{-1}$Pa is determined from the voltage V_{CP6}.

Degree of vacuum (Pa) = $3.33x10^{-2}$ x V_{CP6}

When the degree of vacuum exceeds $1.3x10^{-1}$Pa ($V_{CP6}\geq 4V$), the filament is turned off for protection.

CP7 [IG100]

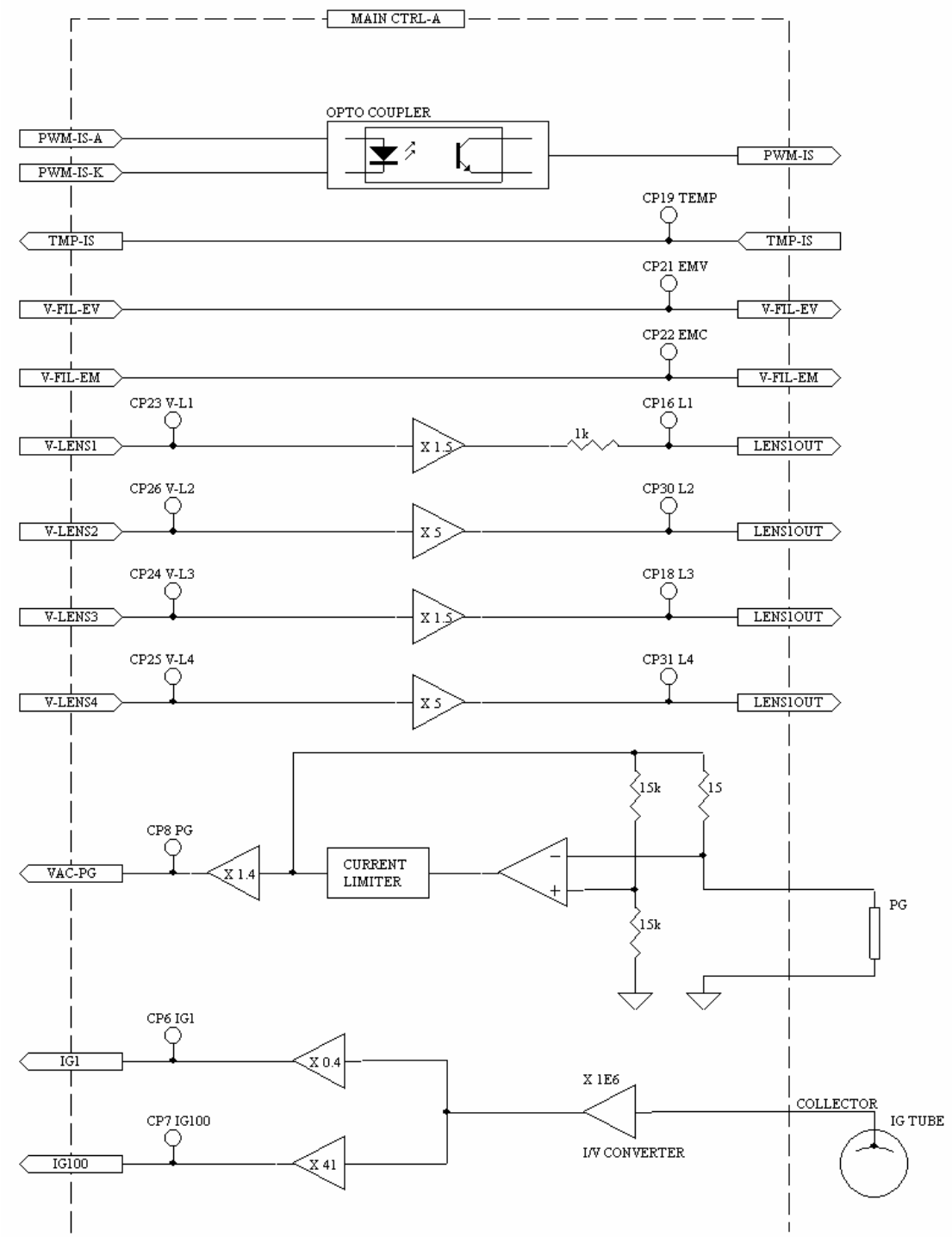
A degree of vacuum below $1.3x10^{-3}$Pa is determined from the voltage V_{CP7}.

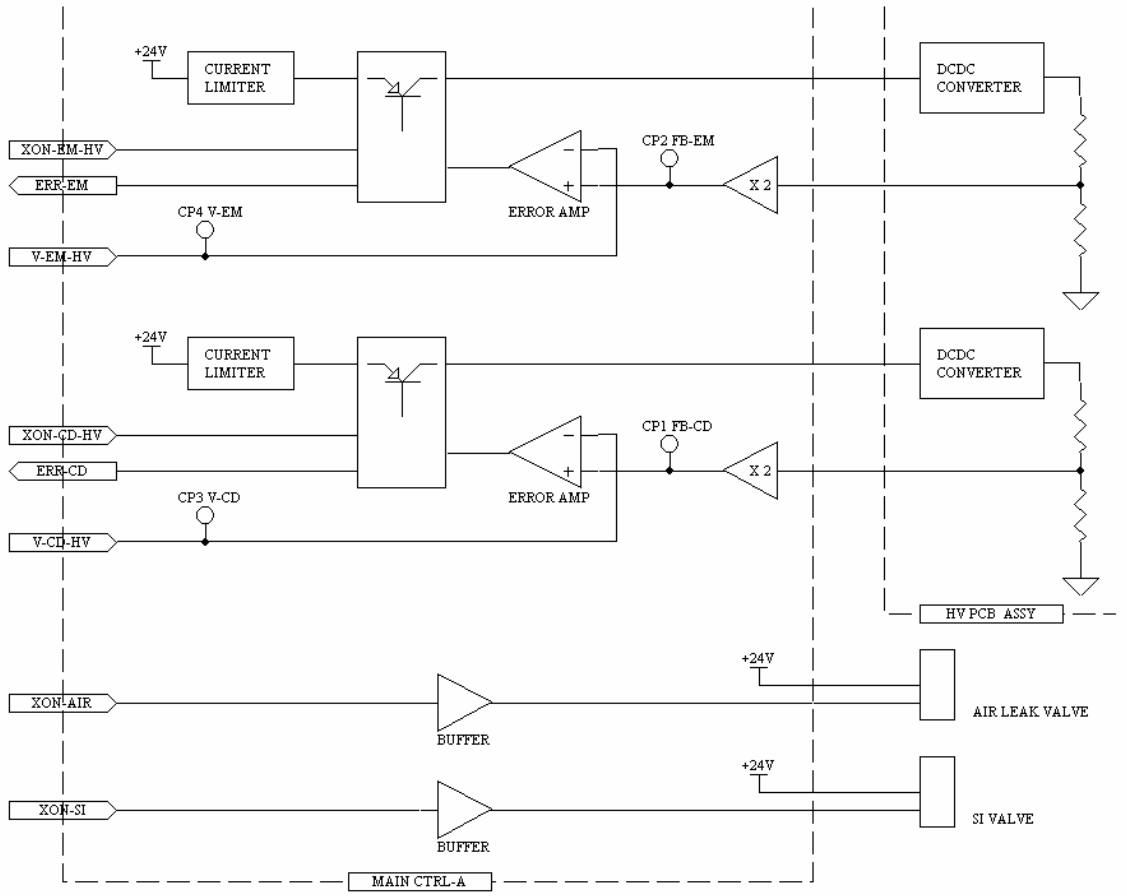
Degree of vacuum (Pa) = $3.28x10^{-4}$ x V_{CP7}

A discontinuity in the ion-gauge measurement bulb or connection cable is evaluated if V_{CP7} is 0.1V or less, and the ion-gauge filament is turned off. Inspect the cable between the measurement bulb and connector J4 on the MAIN CTRL-A PCB.

Check the ion-gauge control circuit (IG CTRL-A) if the ion-gauge measurement bulb filament does not light.

MAIN CTRL-A Block Diagram




+24V
CURRENT LIMITER
DCDC CONVERTER
XON-EM-HV
ERR-EM
CP2 FB-EM
X 2
ERROR AMP
CP4 V-EM
V-EM-HV
+24V
CURRENT LIMITER
DCDC CONVERTER
XON-CD-HV
ERR-CD
CP1 FB-CD
X 2
ERROR AMP
CP3 V-CD
V-CD-HV
HV PCB ASSY
+24V
XON-AIR
BUFFER
AIR LEAK VALVE
+24V
XON-SI
BUFFER
SI VALVE
MAIN CTRL-A

7. IS CTRL-A ASSY

Outline

IS CTRL-A provides functions for filament control and ion-source temperature control. It also functions as a relay board to introduce the lens voltages sent from MAIN CTRL-A into the vacuum vessel.

Filament control (EI mode)

If one filament is selected, the other filament can be used as a trap electrode. The filament potential (emission voltage) and the amount of thermoelectrons emitted from the filament (emission current) are set using D/A. When the filament is turned on, current flows into the filament, causing the emission of thermoelectrons. A proportion of these reach the trap electrode that is held at a potential of +10V, and are measured as the trap current. An error amplifier operates to control the filament current to maintain the trap current equal to the set emission current value.

Ion-source temperature control adjustment

The voltage applied to the heater is proportional to the duty ratio of the PWM waveform generated by the CPU. A platinum (Pt) sensor measures the temperature.

Operation Check Method

If an abnormality occurs, follow the procedures below to check the operation of the IS CTRL-A PCB to efficiently diagnose the problem.

Signal peak abnormality: Checks 1, 2, 3, 4, 5

Ion-source temperature abnormality: Checks 1, 6, 7

Caution

A voltage of -200VDC is supplied to the PCB. To avoid electric shocks or damage to the assembly, touch only the points instructed.

1. Checking the supply voltages

CP3 +15V (normal range: +14.25 to +15.75VDC)

CP5 -15V (normal range: -14.25 to -15.75VDC)

CP9 +24V (normal range: +22.7 to +25.3VDC)

When CP6 is measured with respect CP7: +5V (normal range: +4.9 to +5.3V when filament is off)

2. Checking the lens voltages

Set the lens voltages with the Peak Monitor and confirm the output voltages at the feedthrough contacts on the IS CTRL-A PCB.

The normal output voltage lies in the range: set voltage ±5%.

LENS1, LENS2, LENS3, LENS4

If the output voltages do not lie within the set ranges, conduct the checks described in *2. Checking the lens voltages* for MAIN CTRL-A (page 60).

3. Checking the filament currents

When a filament is on, the filament current can be determined from the following voltage measurements. The relationship between the filament current and the voltage measured with the tester + probe on CP16[FIL] and the - probe on CP18[EV] is as follows:

Filament current (A) = 2 x (V_{CP16} – V_{CP18}) max about 3.5A

If (V_{CP16} – V_{CP18}) = 1.4V, the filament current is 2.8A.

A filament discontinuity is detected and an error occurs if (V_{CP16} – V_{CP18})≤approx. 0.6V, that is if the filament current ≤approx. 1.2A.

The discontinuity in the filament can be easily confirmed by the following method.

Turn off the filament and measure the resistance between F1+ and F1-.

If resistance value ≤1Ω, the filament is normal.

Be aware of the polarity when measuring the resistance; correct measurement is only possible by applying a positive voltage to F1+ and a negative voltage to F1-. If the polarity is unknown, turn off the instrument power, remove IS CTRL-A to eliminate the influence of its circuits and measure the resistance directly at the feedthrough terminals.

4. Checking the TRAP current control circuit

Set the emission current, turn the filament on, and measure the voltages at CP12[EMC], CP13[TRP], and CP14[+10A].

If V_{CP14}≠10V, the IS CTRL-A PCB is probably defective.

V_{CP12}=set current(μA)/100

If emission current = 60μA, V_{CP12}=0.6V.

Any abnormality suggests an incorrect D/A voltage from the CPU PCB.

V_{CP12}=V_{CP13}

Any abnormality could be due to a filament discontinuity or incorrect installation.

5. Checking the emission voltage control circuit

This circuit generates the emission voltage (-10V to -200V).

Set the emission voltage, turn the filament on, and measure the voltages at CP15[EMV], CP18[EV], and CP19[INV].

V_{CP15}= 0.05 x set voltage (V)

If emission voltage = -70V, V_{CP15}=-3.5V.

Any abnormality suggests an incorrect D/A voltage from the CPU PCB.

V_{CP18}= set voltage (V)

A voltage in the range set voltage ±10% is normal. If abnormal, check the voltage V_{CP19}.

If V_{CP19} is not in the range +1 to +15V, the IS CTRL PCB is probably defective.

If the V_{CP19} voltage is in the normal range but V_{CP18} ≠set voltage, the filament wiring is probably touching another electrode inside the vacuum vessel.

6. Checking the heater circuit

The ion-source heater operates on 24VDC.

No temperature rise when the ion-source temperature is set and the heater should be operating could be due to a heater discontinuity, short-circuit, disconnected wiring, or incorrectly installed heater temperature sensor. Follow the procedure below to diagnose problems with the heater.

Check that the CP2 voltage = +19±1V.

If abnormal, replace IS CTRL-A.

Measure the voltage applied to the heater at the feedthrough contacts on the IS CTRL-A PCB.

HT+ Heater + voltage (0 to +24V) Approximately 24V during heating.

HT- Heater - voltage (0V)

The IS CTRL-A PCB is normal if a voltage is applied to HT+.

If the voltage at HT is approximately 0V, a short-circuit has probably occurred in the vacuum vessel.

Turn off the heater with the tool program. (The sound of the relay on IS CTRL-A operating should be audible.) Check that the voltage at HT+ is 0V, and then measure the resistance across HT+ and HT- using the tester resistance mode.

A resistance of 15 to 25Ω is normal. Be aware of the polarity when measuring the resistance; correct measurement is only possible by applying a positive voltage to HT+ and a negative voltage to HT-. If the polarity is unknown, turn off the instrument power, remove IS CTRL-A to eliminate the influence of its circuits and measure the resistance directly at the feedthrough terminals.

Observe the CP1[PWM] waveform with an oscilloscope.

This is normal if an ON/OFF PWM waveform between 19 and 24V is observed, and the HT+ output voltage is approximately proportional to the duty ratio of the PWM waveform (0 to 100%: 0 to 24V).

An abnormal PWM waveform suggests a defective CPU PCB or MAIN CTRL-A PCB.

7. Checking the ion-source temperature measurement circuit

The temperature sensor is a platinum (Pt) sensor.

Check the voltage at CP8[TEMP].

$V_{CP8} \geq 4V$ suggests a discontinuity in the platinum sensor or its wiring.

V_{CP8} 0V suggests a short-circuit in the platinum sensor or its wiring.

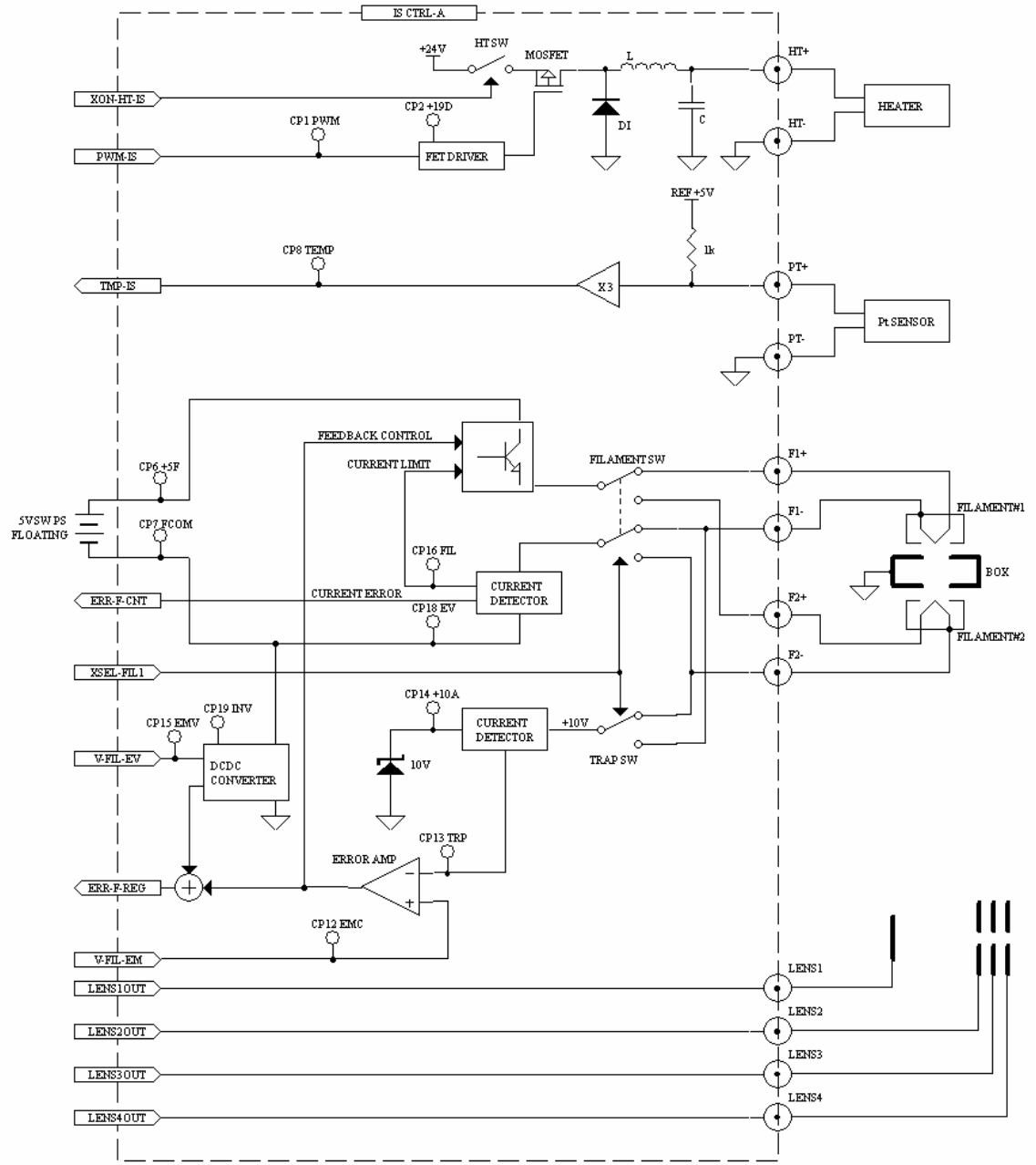
The resistance of the platinum sensor varies approximately linearly from 100 to 250Ω in the temperature range from 0 to 400℃.

Approximate expressions : $R_{Pt}(\Omega) = 0.37 \times T\ (℃) + 100$

$V_{CP8} = 15 \times R_{Pt} / (1000 + R_{Pt})$

Any large discrepancy from these relationships suggests an abnormality in the temperature measurement circuit. Replace IS CTRL-A.

IS-CTRL-A Block Diagram



8. HV PCB ASSY

Outline

HV PCB ASSY have the function that produces the high voltage of detection. MAIN CTRL-A have the function that controls the voltage and on/off that occur.

HV PCB ASSY are being fixed inch a normal device, that is ,EI mode.

HV PCB ASSY, NCI(225-11195-92) are being fixed in a NCI option.

CD(Conversion dinode) HV Circuit is swictching power supply POS(1 to 10kv for NCI)and NEG(-1 to -10kv for EI and CI).

Detector voltage(EM)＝-0.5kV～-3kV

Conversion di-node voltage (CD)=-1kV～-10kV or+1kV～+10kV

Detection device lens voltage=0.084×conversion di-node voltage

Action confirmation method

If an abnormality occurs, follow the procedures below to check the operation of the HV PCB ASSY to efficiently diagnose the problem.

Please refer to even the item of "the confirmation of MAIN CTRL-A high pressure power supply control circuit".

CAUTION！

The voltage on a foundation becomes biggest 10kV with DC. Please do not touch on unpreparedness, Because of the damage prevention of electric shock prevention, measurement devices.

Please turn off the power supply when I remove a foundation. Next, please discharge the remaining electric charge of a high voltage terminal in body with an electric wire and driver etc. And, please do so that it touches.

1．Confirmation of the electric discharge by insulation defectiveness

Please turn off EM and CD On a service program.

And, please confirm the presence of the sound by an electric discharge.

It is thought as the insulation defectiveness of HV PCB ASSY, when it is heard as the sound that discharges is occurring outside a vacuum vessel. In this case、You had better

exchange this part.
Please confirm the following, at the time of such that an electric discharge is occurring in a vacuum vessel.
Please suspend a device. You had better confirm whether dust is not adhering, whether or not wiring is appropriate after takes out a detection device unit.
There is case that is not determined as an error in the electric discharge of a weak electric discharge and period absence. The attention is necessary.

2. Confirmation of the wiring within a vacuum vessel

Please confirm whether or not, the output of the high voltage power supply is out with the next method.
You monitor the base line of the condition of filament off with a service program.
Please turn on only EM. EM is normal if the base line is goes up a moment.
Please turn on only a CD. If the base line goes up a moment in the case of an UNNCI mode (-1kV～-10kV) ,the CD is normal.
If the base line descends a moment conversely in a NCI mode (+1kV～+10kV), The CD is normal.

When the base line does not fluctuate normally 、it stops the device and take out the detection device unit and confirm please whether wiring is not coming off.
When you turned on EM and CD, in the case that an error occurs, next malfunction of a part is thought about whether someday.
The short circuit of the wiring inside a vacuum vessel is conceivable as the cause of defectiveness.
Or, it is conceivable as the cause of the defectiveness of **HV PCB ASSY.**
Besides, it is conceivable as the cause of the defectiveness of **MAIN CTRL-A.**

3. Confirmation of voltage

In the case that there is a high voltage measuring apparatus, The voltage of a high pressure terminal is able to be confirmed directly.
Do not conduct it because the measurement by a general tester is dangerous.
Please set up each detection device voltage(EM), conversion voltage(CD).
Please confirm voltage, with each next terminal.
Detection device voltage
Measurement point: J11 [EM]
Inside resistance: 100 [k Ω]

Conversion dinode voltage

Measurement point: J12 [CD]

Inside resistance: 33M Ω

Detection device lens voltage

Measurement point：

Field through Electrode

Detection device lens voltage=0.084×conversion dinode voltage

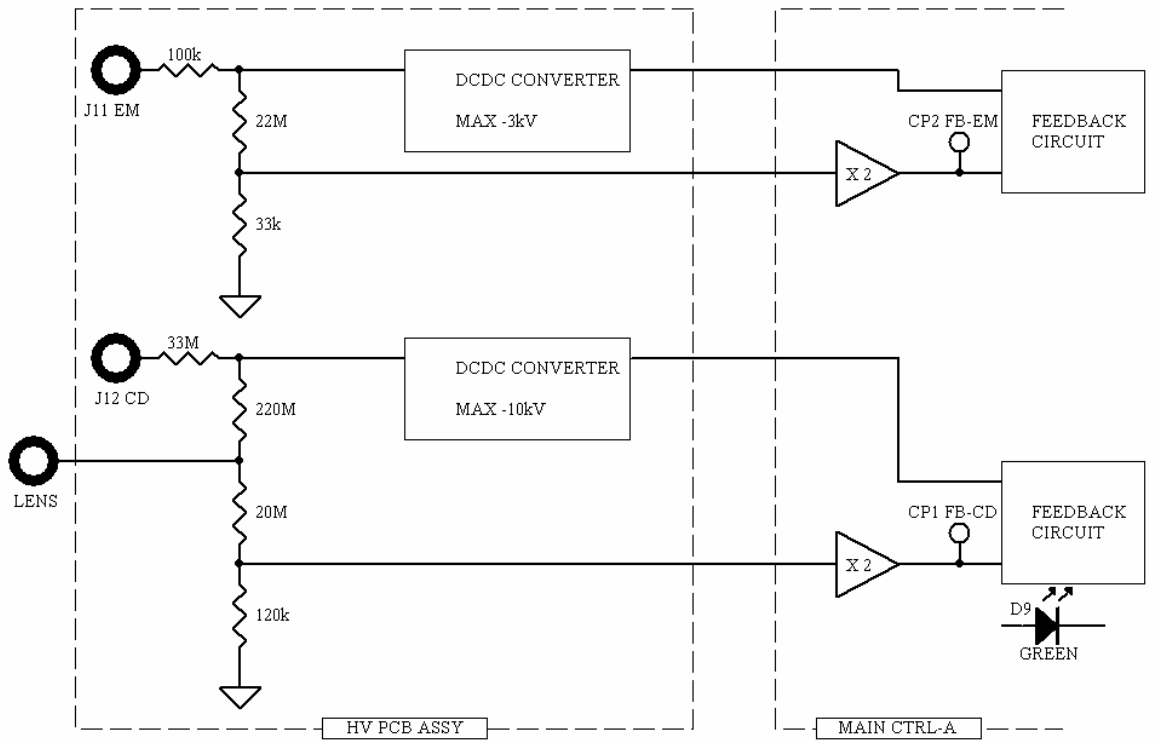
Conversion dinode voltage, becomes big 220V each to every measure current 1uA.

When some extent is exceeded、 it becomes a high pressure power supply error.

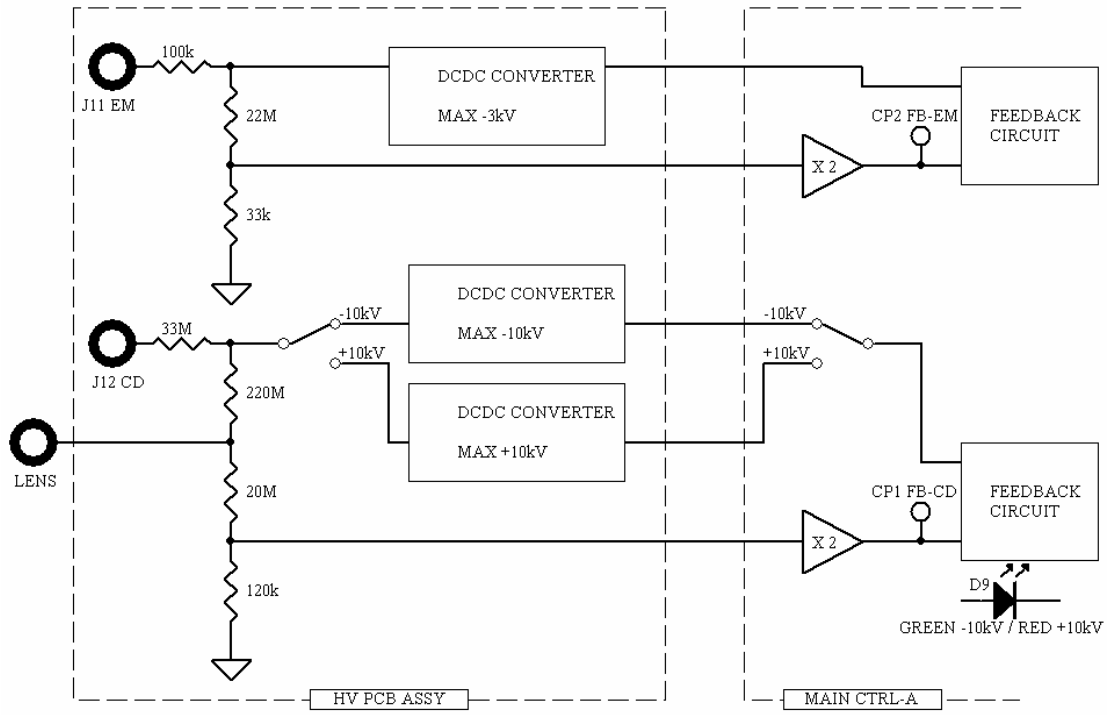
Please pay attention to the input resistance of ameasuring apparatus.

HV PCB ASSY block diagram

(1) UNNCI case of model (EI,CI)



(2) NCI case of model (NCI)



9. PCB ASSY, IG CTRL-A

Outline

IG CTRL-A lights the ion-gauge measurement bulb (IG bulb) filament and generates the grid voltages. The MAIN CTRL-A PCB offers the functions to measure the collector current to determine the degree of vacuum. When the filament lights, thermoelectrons are discharged toward a grid held at a potential of +150V, resulting in a current from the grid to the filament (grid current). As the filament is lit by a power supply with a floating potential, the grid current flows toward earth potential in the IG CTRL-A circuit. This circuit adjusts the current flowing through the filament to maintain a 1mA grid current flow to earth potential. The grid current flows through a Zener diode, which increases the filament potential above earth potential by the amount (Zener voltage + voltage drop in the current detector resistance), giving a potential of +25V at a 1mA grid current. The degree of vacuum is determined from the amount of positive ions captured at the earth-potential collector electrode.

Operation Check Method

If an abnormality occurs, follow the procedures below to check the operation of the IG CTRL-A PCB to efficiently diagnose the problem.

In case of abnormal degree of vacuum measured values, see the item *Checking the ion-gauge vacuum measurement circuit* for the MAIN CTRL-A PCB (page 62).

Caution

A voltage over +150VDC is supplied to the PCB. To avoid electric shocks or damage to the assembly, touch only the points instructed.

1. Checking the installation

One of the four screws locating the IG CTRL-A PCB acts to earth the PCB to the chassis. Current flows may be interrupted if this screw is loose. Be sure to correctly tighten these screws.

Check there is no looseness in the connector socket contacts where the IG bulb pins are inserted.

2. Checking the voltages

Measure the voltage with the tester + probe on CP1[F+5VIG] and the - probe on CP2[F0VIG]. The normal voltage range when IG is off is +4.9 to +5.3V. The voltage drops slightly when IG turns on.

3. Checking the grid and filament voltages

Turn IG on with the tool program and measure the grid and filament voltages (CP4[GRID], CP5[FIL-], CP3[FIL+]). These voltages can also be measured at the IC bulb connector.

Check the grid.

Voltage across CP4[GRID] and IG bulb, Pin 4 = 15010±V

Pull out the IG connector if V_{CP4} is abnormal. If V_{CP4} becomes normal, replace the IG bulb. If the voltage remains abnormal after the connector is disconnected, replace the IG CTRL-A PCB.

Check the filament.

If the filament does not light, turn IG off and measure the resistance between Pin 3 and Pin 5 of the IG bulb. The resistance should not exceed 1Ω. Replace the IG bulb if the resistance is abnormal.

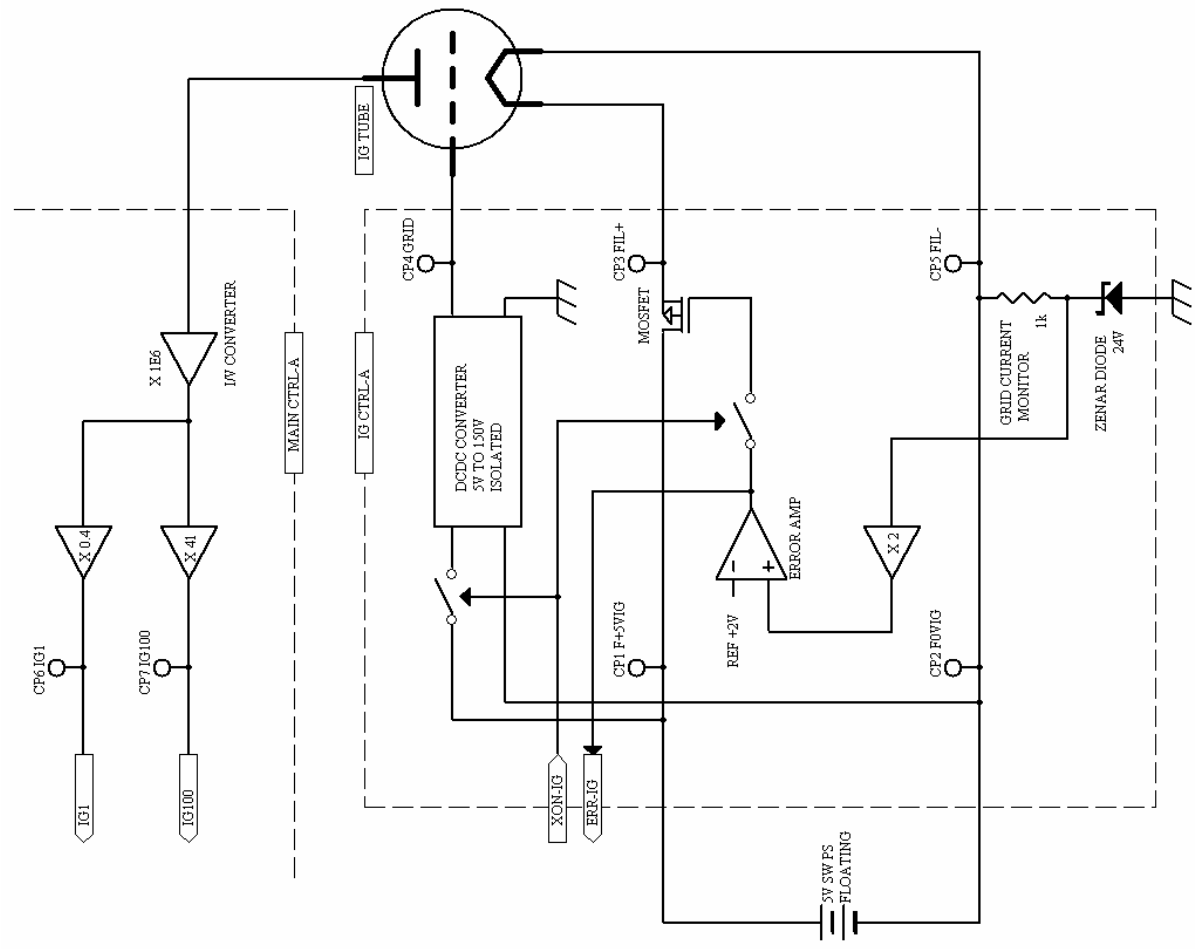
If the filament does light:

Voltage across CP5[FIL-] and IG bulb, Pin 5 = 251±V

An abnormal V_{CP5} value indicates an abnormal grid current. Replace the IG CTRL-A PCB.

If the filament is normal : Filament voltage (VCP3 – VCP5) = 3.0 to 4.0V

IG CTRL-A PCB Block Diagram



10. PCB ASSY, CPU-A

Outline

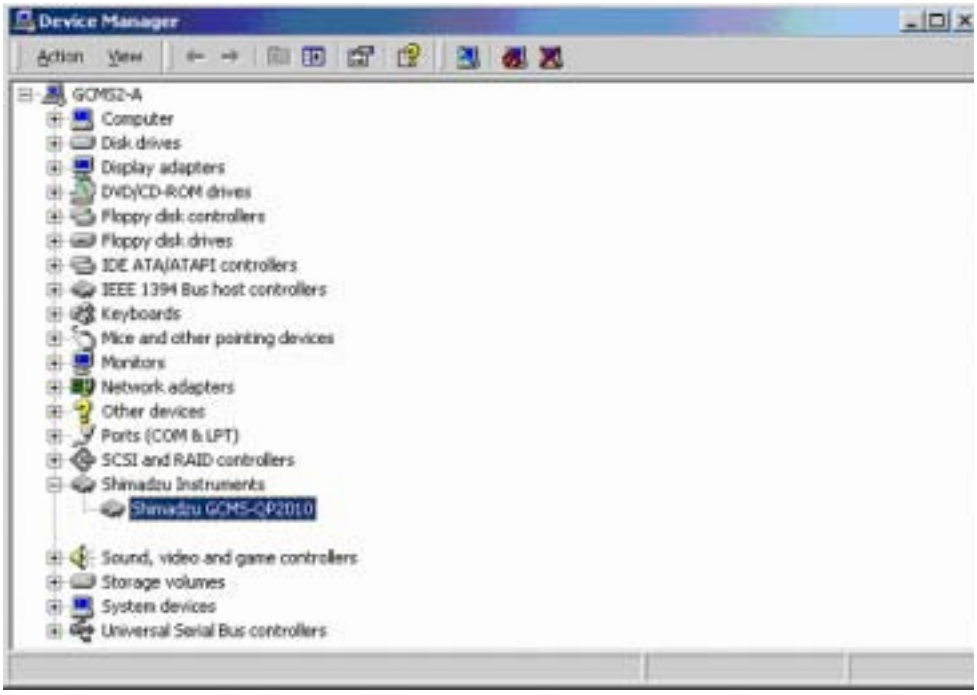
CPU-A provides overall control of the system.
Most PCB operations can be monitored at the PC.

1. Checking the supply voltages

Check the supply voltages. The voltages should be as follows, when the chassis is grounded.
J6(1) +15V (normal range: +14.25 to +15.75V)
J6(2) GND
J6(3) -15V (normal range: -14.25 to -15.75V)
J6(4) GND
J6(5) +5V (normal range: +4.8 to +5.3V)

2. Checking the operation

Turn on the PC, select Start, Settings, Control Panel to open the Control Panel. Select System and then click the Hardware tab and the Device Manager button.
Confirm that GCMS-QP2010 is listed, as shown below.
If GCMS-QP2010 appears correctly, check that the tool software runs.



Explanation

CPU-A incorporates the functions below.

Function	Description	Comments
CPU		
DRAM	4MB	
E2PROM		
Temperature sensor		
IEEE1394	1 port	For PC communications
EIA232	1 port	For GC communications
ADC	10Bit 8CH	Built into CPU
	16Bit 1CH	For data acquisition
Integrator	FPGA	
DAC	12Bit 12CH	
	16Bit 1CH	For RF settings

It is almost certain that CPU, DRAM, and IEEE1394 are operating correctly if the device

drivers are installed. Similarly, the E2PROM is probably operating correctly if the turbo molecular pump accumulated time is correctly calculated. EIA232 is operating correctly if GC communications are conducted normally. ADC and DAC operation can be confirmed on PCBs besides CPU-A.

Checking the DIP switches

CPU-A has two sets of DIP switches.

The relationship between the DIP switch settings and operating mode are shown in the table below.

SW1	SW2	Operating mode	Application
OFF	OFF	MCU mode2	Not used (rewriting Flash ROM not possible)
ON	OFF	User program mode	Factory setting (rewriting Flash ROM possible)
OFF	ON	MCU mode0	Under development
ON	ON	Boot mode	To rewrite Flash ROM during boot up

Normally, leave the factory setting unchanged. The Boot mode is used during manufacture or when CPU-A cannot be rebooted due to unsuccessful rewriting of the Flash ROM.

11. RF PS ASSY

Outline

The RF PS ASSY generates the high frequencies applied to the main rod and pre-rod.
As shown in the block diagram, the main rod comprises a pair of opposing poles maintained at the same potential, to which the following voltages are applied:
A pole = high-frequency (V) + DC voltage (U) + AC voltage (AC) + bias voltage
B pole = high-frequency (-V) + DC voltage (-U) + AC voltage (-AC) + bias voltage
(Where high-frequency = 1.05MHz, AC=52.5kHz.)
Only the high-frequency and bias voltage are applied to the pre-rod.

Operation Check Method

If an abnormality occurs, follow the procedure below to check the operation of the RF PS ASSY to efficiently diagnose the problem.

Caution

A ±2500V high-frequency voltage and±500VDC are supplied to the RF PS ASSY. To avoid electric shocks or damage to the assembly, touch only the points instructed.

Caution! Static Electricity

The RF PS ASSY contains parts that are sensitive to electrostatic discharge (ESD).
Static electricity at 4000V or more can easily accumulate on the human body and be discharged.
D3 to D6 on the RF GENE-A PCB can withstand only 10V static electricity.
Take the appropriate ESD countermeasures when replacing RF GENE-A.

1. Checking the supply voltages

Check the supply voltages. The voltages should be as follows, when the chassis is grounded.
CP1 +15V (normal range: +14.25 to +15.75VDC)
CP2 -15V (normal range: -14.25 to -15.75VDC)
CP3 +500V (normal range: +510 to +580VDC)
CP5 -500V (normal range: -510 to -580VDC)

CP6 -24V (normal range: -22.7 to -25.3VDC)

CP7 +24V (normal range: +22.7 to +25.3VDC)

CP12 +5V (normal range: +4.8 to +5.3VDC)

2. Checking the tuning

Use the tool software to check if the tuning is correct.

If tuning is correct (if the screen value valley can be confirmed by turning the core trimmer) it is safe to judge that the circuits related to the RF power-supply high frequency (V) are normal.

Conversely, if the tuning is not correct, the high-frequency-related circuits are defective or the load is abnormal. Check the wiring around the QP rod.

Explanation

When the RF value is set with the tool software, the set voltage is output from CP8[V-RF] (approximately 4.58V at m/z500).

1.05MHz is output when the RF output turns on, and a sine wave is output from CP13 to create a proportional relationship between the set value and high-frequency wave detection feedback value CP4[FB]. If the proportional relationship is not maintained, output CP16 goes out of range and an error signal is output.

CP13 is connected to the primary side of the coil and outputs an approximately 50 to 70V_{P-P} sine wave at a setting of m/z500. The value monitored by the tool software is the value read from CP14.

3. Checking the U voltage

If the check of the tuning indicated that the V voltage is correct, next check the U voltage.

When the main rod bias is set to m/z500 at -3.5V, check that the CP10[U1] and CP9[U2] values are approximately 204V at the positive side and approximately -210V at the negative side. It is recommended to use the Tuning Check window to make the RF setting (because RF scanning is conducted from other windows). The RF setting changes due to switching the positive and negative polarity (A or B) and due to the ionization mode (positive or negative).

Explanation

As the U voltage is generated from a feedback output, if the U voltage is correct, then the V voltage must also be correct. (This provides reconfirmation.) RF GENE-A outputs no error signal if the U voltage is not output. Consequently, the U voltage output should be suspected if no peaks are obtained but the RF power supply outputs no error.

4. Adjusting the trimmers

If the checks above are all satisfactory but still no peaks are obtained, possibly the settings of trimmers VR1 and VR2 are seriously wrong. In this case, turn VR1 while monitoring the low mass numbers m/z18 and m/z28 to obtain equal peak amplitudes. If this adjustment is not possible even by fully turning VR1, switch JP1 and attempt the adjustment again. Repeat the adjustment with 1) JP1 unshorted, 2) 1 to 2 shorted, and 3) 2 to 3 shorted. If equal peak amplitudes are achieved, conduct fine adjustment of the trimmers using the tool software.

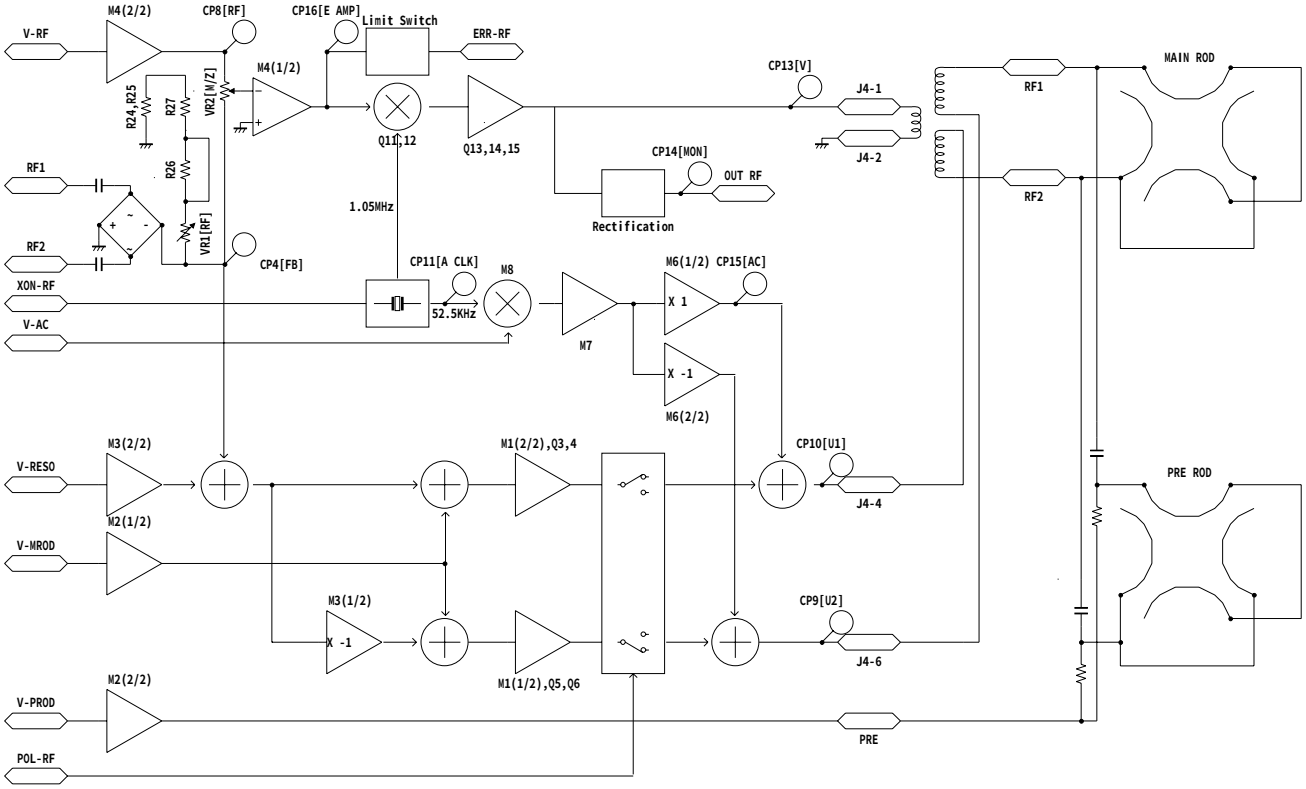
5. Checking the AC voltage

The AC voltage is normal if 2 to 3V_{P-P} is output from CP15[AC] when m/z500 is set. (It fluctuates due to AC adjustment.)

6. Checking the pre-rod bias

The pre-rod bias is normal if JT1[PRE] is within pre-rod bias set value ±10%.

RF GENE-A Block Diagram



12. PCB ASSY,DI CTRL-A

Outline

DI CTRL-A has the next function.

There is a illumination of amplification and, LED of the heat electromotive force of heater voltage occurrence and, TC of DI probe and it is the function such as the recognition of a DI option furthermore.

DI option is recognized when the circle style connector of the tip of the cable that is out from the DI introduction is connected to a DI CTRL-A foundation.

This recognition is conducted, when draw out a circle style connector and also shone.

The condition of DI probe is not related.

When DI probe is inserted and a temperature program be started,

Producing the voltage corresponding to the Duty ratio of the PWM signal that is sent from a CPU it supplies it to a heater. The heat electromotive force of TC that was built to probe is amplified with an amplifier 200 times.

It is used to temperature measurement.

Action confirmation method

There be some abnormality and please do with the following procedure in the case that the action of DI CTRL-A is confirmed.

Rationally malfunctioning normal judgment is possible.

１．Confirmation of power supply voltage

CP5 +15V （+14.25V～+15.75V is normal）

CP6 -15V （-14.25V～-15.75V is normal）

CP8 +24V（+22.7V～+25.3V is normal）

0V with CP7, CP9

２．Confirmation of heater voltage

CP3[+19VD]：+19V If this voltage is constantly be not out ,it is not possible heater heating.

It is the abnormality of a DI CTRL-A foundation.

It is as follows during DI probe heating.

CP2[PWM-DI]：Frequency 50kHz PWM wave-like between voltage level+19V/24V

CP4[V-HT]：

Heater voltage of probe

According to PWM of Duty in comparison to 0～100%, 0 voltage,～+24V comes out.

3．Confirmation of a TC temperature measurement circuit

It is the voltage amplifier of 200 times.

CP1[TMP-DI]：

Voltage 0.008×(measurement temperature ℃-23) it becomes. (0.8V at the time of123℃)

When DI probe comes off and TC is not connected and, when TC be snapping ,it becomes 4.8V over.

The voltage of CP1 TMP-DI can be measured even with checkpoint CP11 [TMP DI] on a MAIN CTRL-A foundation.

In the case that the CP11 voltage on the CP1 voltage and MAIN CTRL-A on DI CTRL-A do not agree, The defectiveness of the buffer amplifier on defective or MAIN CTRL-A of connection cable is conceivable.

4．Confirmation of LED illumination

The control of the illumination of LED is not DI CTRL-A. The control of the illumination of LED is conducted with MAIN CTRL-A.

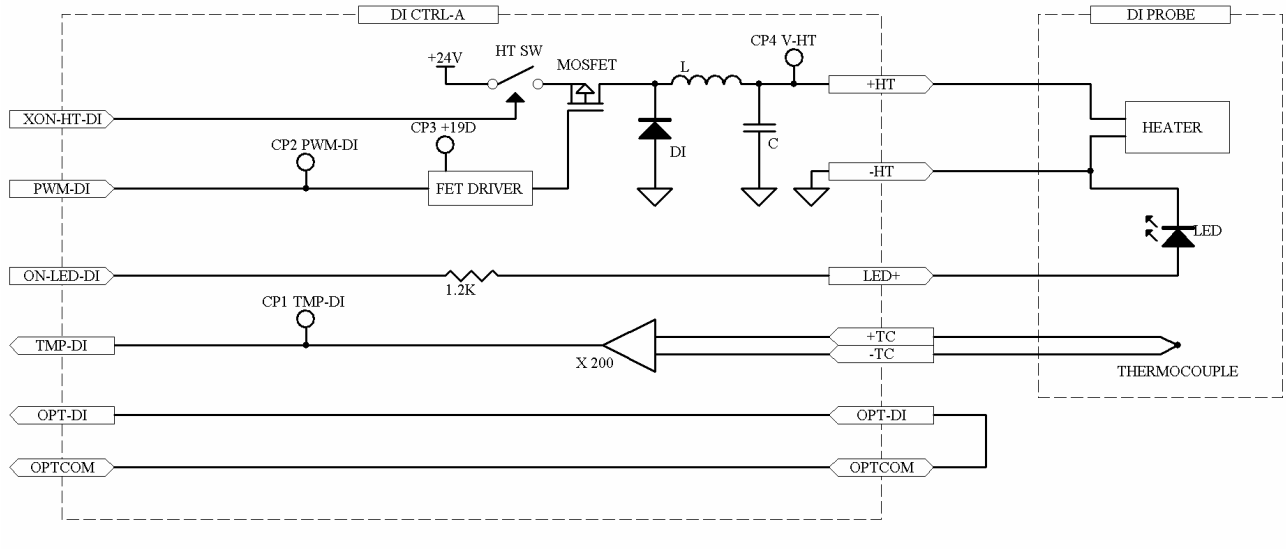
In the case that LED is not lighted connection defective etc. of the cable between defective, DI-MAIN of defective, probe of introduction cable are conceivable.

5. Confirmation of automatic recognition

The automatic recognition of DI option conducts it with the presence of the installation of the connection connector with the introduction.

In the case that it is not recognized automatic the connection defectiveness of the cable between defective, or DI-MAIN of introduction cable is conceivable.

DI CTRL-A block diagram



13. RELAY BOX-A

Outline

On/off of rotary pump 2 (RP2) that uses it with DI option in RELAY BOX-A is conducted.
The relay point of contact signal is sent to the RP2 CTRL connector of the device back.
On/off of RP2 is controlled in accordance with the on/off.

Action confirmation method

There be some abnormality and malfunction rationally, when I do it with the following procedure in the case that the action of RELAY BOX-A is confirmed and the normal judgment is possible.

CAUTION！

The voltage of the inside becomes AC100～240V.

Please pay attention sufficient when the inside is confirmed due to the damage prevention of electric shock prevention, measurement devices.

1．Confirmation of power supply voltage

Whether the power supply voltage that is using it, with the power supply voltage that is written to RELAY BOX epitaph board be agreeing is confirmed.

2. Confirmation of RP2 CTRL

Please turn on RP2.
Please confirm that 2 pin of the RP2 CTRL connectors of the for device back are connected.
Please turn off RP2. Please confirm that 2 pin of the RP2 CTRL connectors of the device back for, are not connected.
Power supply voltage is out, to the cable of RP2 CTRL that is growing from RELAY BOX.
Please quit because it invites the accident such as an electric shock to draw a terminal and confirm an action.

3. Confirmation of no fuse breaker

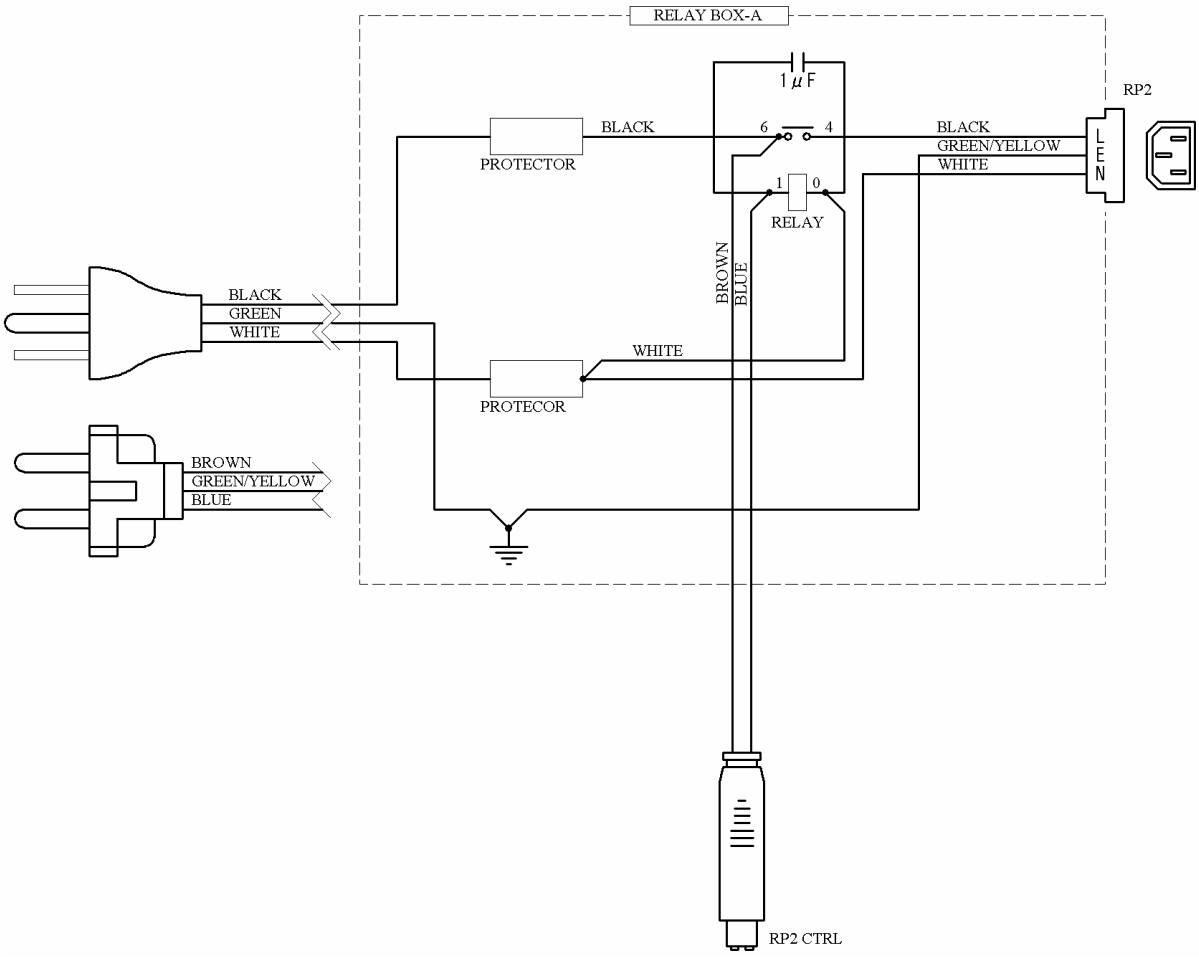
No fuse breaker is attached for overcurrent protection.
In the case that the no fuse breaker is acting there are possibility such as the accident of the faulty or inside wiring of a rotary pump. Please cause to return a no fuse breaker, after

the cause of an overcurrent is removed.

4. Confirmation of the inside

The wiring and tab terminal inside RELAY BOX confirm whether they are not coming off.

RELAY BOX-A block diagram



5. Appendices

1. Precautions during maintenance work
2. Adjustment in the high mass-number range
3. Detailed explanation of CI and NCI
4. Installation Guidelines (including List of Service Parts and Consumables)
5. Installation Completion Checksheet
6. How to change Turbopump

1. Precautions during maintenance work

Replacing CPU-A

☐ Restore the backed up E2PROM contents.

☐ Upgrade the Flash ROM, if required.

Replacing RF PS Assy

☐ Sensitive to static electricity. Take care.

☐ Conduct tuning.

☐ Adjust according to the RF power supply adjustment.

Replacing a turbo molecular pump (TMP)

☐ Reset the TMP operating time.

Replacing a rotary pump (RP)

☐ Reset the RP operating time.

Reference

Approximate Maintenance Plan (Units: months)

Item	3	6	9	12	15	18	21	24	27	30	33	36
RP oil	*	*	*	*	*	*	*	*	*	*	*	*
Clean ion-source		*		*		*		*		*		*
GC trap		*		*		*		*		*		*
GC molecular sieve filter				*				*				*
RP overhaul						*						*
Clean lenses						*						*
Clean pre-rod						*						*
Detector												*
IG												*
PG												*
TMP overhaul												*

2. Adjustment in the high mass-number range

This instrument incorporates an auto-tuning function that conducts mass-number calibration at m/z614. Mass-number displacement is rare in the normal range of operation (up to approximately m/z700.)

However, displacement from the calibration at m/z is possible in the high mass-number range.

Ensuring accurate calibration in the range m/z700 to m/z1000 requires manual calibration by injecting a triazine (Tris(perfluoroheptyi)-S-triazine) high-mass-number standard sample into the column.

Procedure

Instrument conditions

Sample: triazine 1% solution in acetone, ultrasonically mixed

INJ: 250˚C

COL: 50˚C (1 min.)-5˚C /min-100 ˚C (1min)-30˚C /min-250˚C (10min)

I/F: 250˚C Ion source: 200˚C

Column head pressure: 100kPa Total flow rate: 30mL/minute

Splitless injection (1 min. sampling)

Triazine flow time is approximately 3 minutes between minute 11 and minute 15

① Take 1μL triazine sample into a syringe and inject it into INJ. Wipe any sample from the syringe tip before injecting the sample.

② Monitor m/z771, 886, and 1016 on the Peak Monitor window. Leave the filament off for the first five minutes after sample injection, turn the filament on, and wait for the peaks to appear.

③ The triazine peak can be seen for the three minutes between minute 11 and minute 15. Check the mass number (within ±0.3 mass) and resolution (FWHM resolution 0.1M max.). Conduct manual compensation, if necessary.

④ After making this check, increase the column temperature to 250˚C to drive out the triazine. Ten minutes at 250˚C is insufficient, conduct this process for 1 hour at 250˚C.

Caution) Traces of the injected triazine may remain in the sample lines and hinder subsequent analysis. Allow the column to age overnight at 250˚C before conducting ultramicroanalysis.

Degree of residue

After driving the triazine out of the column for one hour at 250°C, SCAN data measurements (approx. 1ppm) can be conducted without hindrance.

Aging for 2 to 3 hours at 250°C is recommended for microanalysis (SIM measurement 100ppb or below) but aging overnight is recommended for ultramicroanalysis (10ppb or below).

Reference)

High-mass-number standard sample	TRIS 0.5g Tris(perfluoroheptyl)-S-triazine-Maas-Spec （P/N 225-09493-01）
Standard sample	PFTBA 5g Perfluorotributylamine （P/N 225-09493-03）

3. Detailed explanation of CI and NCI

Model
There are three types of QP2010 dependent on the types of ionization.
Ver. 2.1 of the GCMSsolution is required to use the CI, NCI, and DI option.

Description	Notes	**Part Number**	**Remarks**
GCMS-QP2010, **EI** without RP	The rotary pump RP1 must be obtained separately. Order the GCMSsolution Ver. 2.1 system package together.	225-10040-xx -92: 115V -34: 230V*	C7 *CE marked
GCMS-QP2010c, **EI and CI** without RP	The rotary pump RP1 must be obtained separately. Order the GCMSsolution Ver. 2.1 system package together. Ver. 2.1 of the GCMSsolution is required to use the CI.	225-10041-xx -92: 115V -34: 230V*	C7 *CE marked
GCMS-QP2010nc, **EI, CI, and NCI** without RP	The rotary pump RP1 must be obtained separately. Order the GCMSsolution Ver. 2.1 system package together. Ver. 2.1 of the GCMSsolution is required to use the CI and NCI.	225-10042-xx -92: 115V -34: 230V*	C7 *CE marked
GCMSsolution Ver. 2.1 system package	Order this system package together with GCMS-QP2010 main frame. Ver. 2.1 of the GCMSsolution is required to use the CI, NCI, and DI option.	225-06628-92	C7

Major different points from 5050A
EI and CI (SEI, SCI) can be simulated using the NCI ion source (for the NCI equipped model only)
Simulated CI (SCI) mode in NCI ion source is added.
Ionization mode can be selected from SEI, SCI and NCI by indication from PC in NCI ion source.
Note : SEI in CI ion source is not available.
Selection of reagent gases
QP2010 has **two inlet lines** for reagent gas. **Selection of reagent gas** is available from two types of gas by switching the inlet line from PC.
RP2 is unnecessary for CI and NCI
The rotary pump, which is a backing pump for TMPs, evacuates the reagent gas line at the same time.

Specification

[1] CI

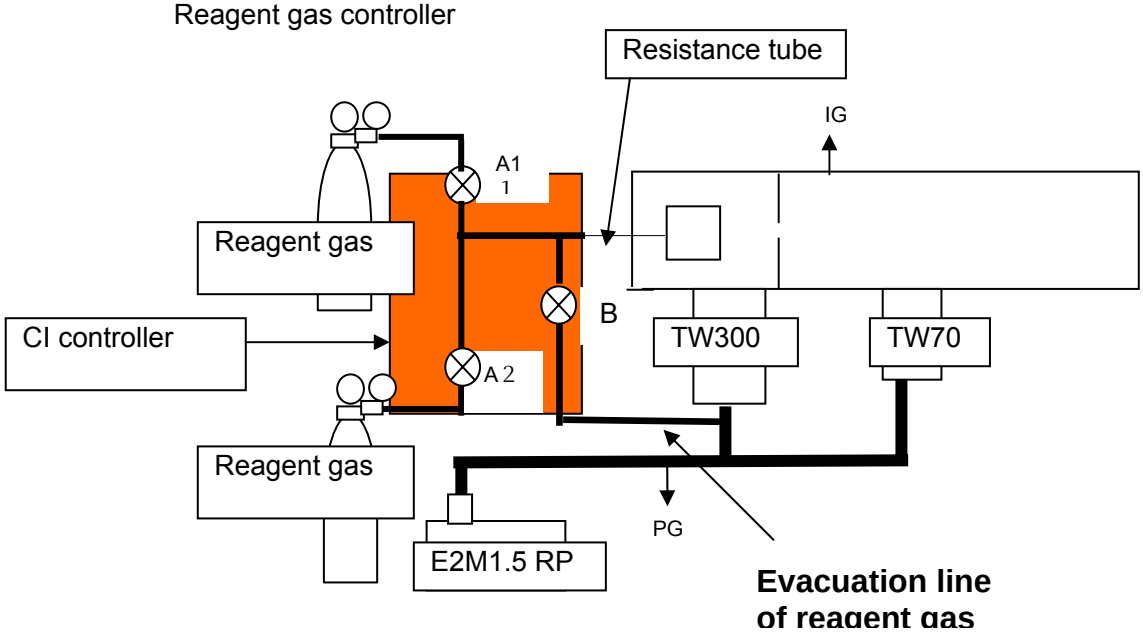
1. Sensitivity	100pg benzophenone Quasi-molecular ion S/N>150 at M/Z183 (RMS) Reagent gas: methane, Scan range: 100-250u, Interval: 0.6sec
2. Reagent gas	Methane, isobutane, ammonia
3. Ion source	Ion source box exchange type
4. Reagent gas introduction system	2 line system
5. Auto-tuning	Capable
6. Max. column flow rate (He)	5mL/min (restricted compared to EI to allow introduction of the reagent gas)

[2] NCI

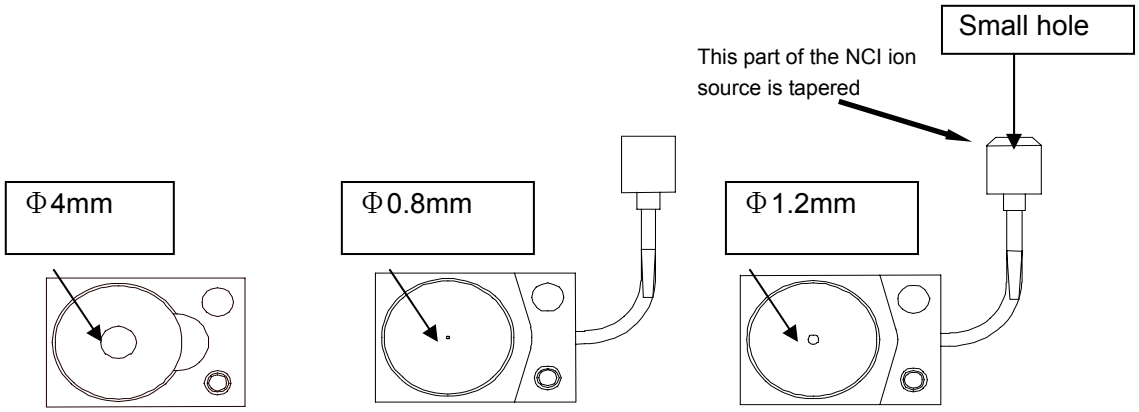
1. Sensitivity	100fg octafluoronaphthalene Molecular ion S/N>100 at M/Z272 (RMS) Reagent gas: methane, Scan range: 200-300u, Interval: 0.5sec
2. Reagent gas	Methane, isobutane, ammonia
3. Ion source	Ion source box exchange type. Simulated EI (SEI*) and simulated CI (SCI*) spectra can be collected using the NCI ion source box. * SEI and SCI are modes which simulate EI and CI ionization respectively using the NCI ion source. The ionization method can be easily changed from the software. However, note that, compared to a dedicated ion source, the signal intensity may be reduced and the mass spectrum pattern may differ. A dedicated ion source must be used in analyses requiring sensitivity and precision.
4. Reagent gas introduction system	2 line system
5. Auto-tuning	Capable
6. Max. column flow rate (He)	5mL/min (restricted compared to EI to allow introduction of the reagent gas)

Change from EI model

Interface
The interface for CI/NCI is different from that for EI, because reagent gas is introduced through interface in QP2010.
Reagent gas controller

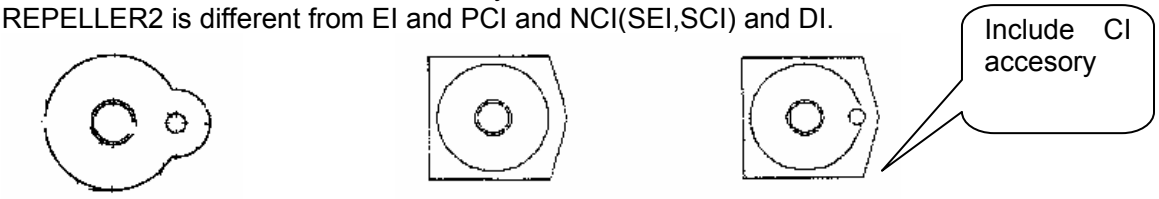


CI ion source / NCI ion source



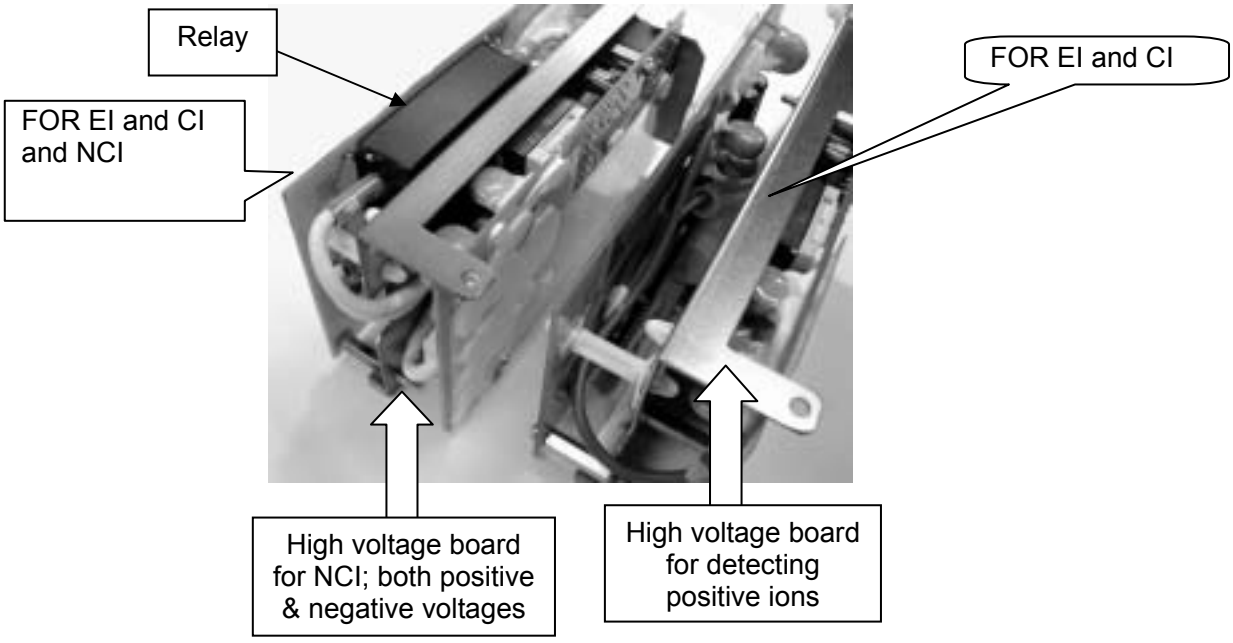
For EI For CI For NCI

REPELLER2 is include REPELLER assy in front of ion sorce.
REPELLER2 is different from EI and PCI and NCI(SEI,SCI) and DI.



REPELLER2 EI REPELLER2 CI, NCI REPELLER2 CI ,NCI（DI）

High voltage power supply for NCI


Relay
FOR EI and CI
FOR EI and CI and NCI
High voltage board for NCI; both positive & negative voltages
High voltage board for detecting positive ions

4.Shimadzu Gas Chromatograph Mass Spectrometer

GCMS-QP2010

Installation Guidelines

(Installation Preparations and Checks)

Analytical Instruments Division

SHIMADZU CORPORATION

1. Introduction

These installation guidelines summarize the preparations that the customer should make to smooth the installation of the delivered GCMS-QP2010.

Please follow these guidelines to ensure safety, reliable analysis, and long use of the instrument.

2. Installation example

The diagram on the next page shows the example of a standard GCMS-QP2010 configuration installed on a table. (The oil rotary pump ⑦ is located on the floor.)

Leave a space of at least 300mm between the rear edge of the table and the wall for the following reasons:

(1) to position the oil rotary pump;

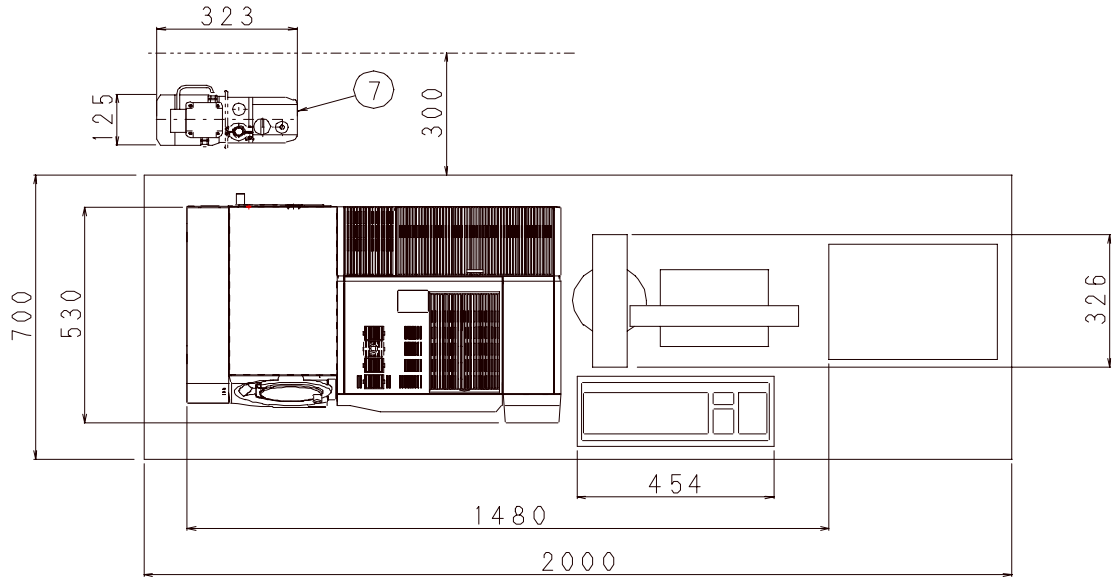
(2) for the discharge of hot air during column-oven cooling;

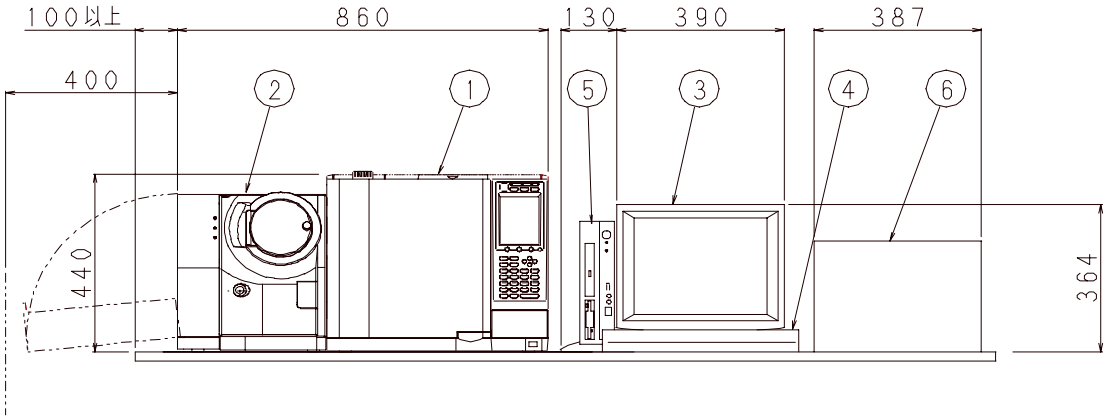
(3) for maintenance.

Also, for inspection and maintenance purposes, leave a space of at least 400mm at the left of the table.

3. Installation room conditions

Temperature	Guaranteed within specification 18 to 28°C (constant) Guaranteed operation 15 to 35°C (*) Choose a location not subject to direct sunlight or air-conditioner output. During normal analysis, the instrument generates approximately 1.5kW. (*) The instrument will operate across the guaranteed operation temperature range above. However, operation for long periods outside the temperatures guaranteed within specification can reduce the instrument life and have other adverse effects on the instrument.
Humidity	40% to 70% (no condensation)
Installation location	Sturdy table approx. 2000mm (W) x 700mm (D), able to easily support 110kg. Leave at least 300mm space behind the table.
Others	The room where the instrument is installed should be as free as possible of harmful elements, such as dust, vibrations, electromagnetic fields, and corrosive gas. Do not use the instrument in an explosive-gas environment.





Installation example (The dimensions of the PC and printer may vary according to the model.)
See below for the cable and pipe lengths.

MS to rotary pump	vacuum pipe	approx. 1.5m
	power cable	approx. 1.5m
PC to MS	cable	approx. 2m (Note 1)

Reference number	Description	Dimensions (mm)			Weight (kg)
		W	D	H	
1	GC	515	530	440	30
2	MS	345	494	390	44.5
3	Monitor	390	189	364	4.7
4	Keyboard	454	173	54	1
5	PC	171	326	323	6.5
6	Printer	387	283	274	7
7	Oil rotary pump	125	323	189	10

Note 1 A 4.5m cable is also available to install the PC and MS further apart. Order it if required.

Cat. No.	Description
070-60311-03	Cable AXJ231132 (4.5m)

4. Power requirements

Caution Provide the instrument with a separate power supply protected by an earth leakage breaker. It must not share a power supply with any other equipment.

Caution To prevent electric shocks, connect to earth with a grounding resistance not exceeding 100Ω.

Note Although the instrument is designed to operate normally with ±10% AC line voltage fluctuations, including accumulated rapid noise, to ensure performance specifications are met, the voltage fluctuations (including noise) should not exceed ±5%. The power supply equipment must be improved if the voltage fluctuations exceed ±10%. Frequency fluctuations must not exceed ±0.5Hz.

The power supply requirements for each unit are listed below.

* 115V instrument

Unit	Voltage	Capacity	Cable length	Terminal type
GC	115VAC,	1800VA	2.0m	Fig. 1

MS	single-phase	1000VA	2.5m	Fig. 2

Separate power supplies are needed for the PC, monitor, and printer.

230V instrument

Unit	Voltage	Capacity	Cable length	Terminal type
GC	230VAC, single-phase (*)	2600VA	2.0m	Fig. 1
MS	100VAC, single-phase	1000VA	2.5m	Fig. 2

Separate power supplies are needed for the PC, monitor, and printer.

Attention
In the case that DI of a option is used the power supply of RP2 is necessary.
The RP2 of voltage is 115v or 230v.
The electric power of the consumption is about 200 VA.

(*) Use a step-up transformer from a 100V or 200V amplifier. The maximum current with a 100VAC power supply is approximately 26A (with no options). Ensure the wiring has sufficient capacity. Use of the following step-up transformers is recommended.

Cat. No.	Description	Capacity	Cable length	Terminal type
225-10690-91	Step-up transformer for 200VAC	3kVA	3.0m	Fig. 1

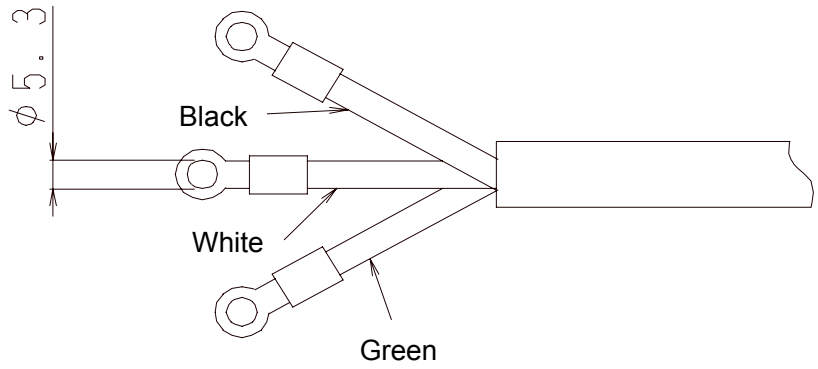


Fig. 1

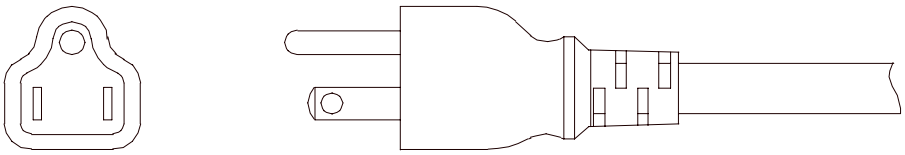


Fig. 2

Reagent gas

Please prepare the following thing as case, reagent gas with CI and also NCI. Attaching, change 2 kinds of reagent gas simultaneously it can use it.

Please prepare it without fail because any gas of isobutene or methane are necessary at the time of an installation.

Gas	Purity	Filling quantity and container capacity	Container with a manufacturer	regurator
CH_4 metane (017-33021-01)	99.95% or more	Filling quantity 15MPa Container capacity 3.4L	Takachiho chemical industry TYPE TV1024	Takachiho chemical industry TU1065 (注) Left screw (040-72004)
$i-C_4H_{10}$ isobutane (017-33031-03)	99.9% or more	Filling quantity 1.5kg Container capacity 4.8L	Takachiho chemical industry TYPE 4.8LP	Takachiho chemical industry TU-1066 (caution) (225-09552) Adapter with a/the container (017-33030)
NH_3 Ammonia (017-33010)	99.9% or more	Filling quantity 3.5kg Container capacity 10L	Sumitomo Seika Chemicals (Pay attention container etc. of note Nippon Sanso because there is in the case of a right screw)	Takachiho chemical industry TUS1063 (caution) Left screw Stainless steel production (210-14191)

There is two piece pipe of reagent gas as for CImodel and NCI model.
This type of reagent gas pipe can not connect to other reguretor of the abovetable.
Please consult it with a merchant, in the case that other types are used.
"Exit form: the φ8.5 hose joint hand is installed with a M12X1 bag nut and an exchange possible type"

5. Gas

Helium (He) is employed as the carrier gas in the GCMS-QP2010.
The gas type, purity, and pressure are designated in the table below. Provide gas and a gas pressure regulator of the types designated in the table, or their equivalents.

Gas	Purity	Pressure and capacity	Manufacturer	Pressure regulator
He (helium)	99.995% min.	15MPa (150kgf/cms) 47L	Iwatani & Co. Ltd.	Koike Sanso Kogyo Co., Ltd. PPR-He 221-35999-03

* 10-digit numbers are Shimadzu catalog numbers.

300 to 980kPa He supply pressure is required to the GC. However, some supply pressures have a limiting effect on the pressures that can be set at the GC. Normally

a supply pressure 700 to 800kPa is required.
Even higher purity helium (99.999% to 99.9999%) is recommended for some applications, such as the analysis of pesticides.
The following gas purification filter is available to eliminate traces of oxygen and organic matter from the pipes. Use this filter, if necessary.
See the *List of Service Parts and Consumables* for details.

He gas purification filter kit GLC Center number: 544-102

Piping between cylinder and GC-QP2010

The following carrier gas pipes are available from Shimadzu. Order the pipe required before installing the instrument.

Cat. No.	Description
201-48067	Gas pipe 2.5m
201-48067- 05	Gas pipe 5m
201-48067- 10	Gas pipe 10m
201-48067- 15	Gas pipe 15m
201-48067- 20	Gas extension pipe 2m

Cautions on handling high-pressure gas cylinders

The gas cylinders used are covered by the High-pressure Gas Safety Law. Strictly follow the provisions of the High-pressure Gas Safety Law when handling these cylinders.

General Precautions

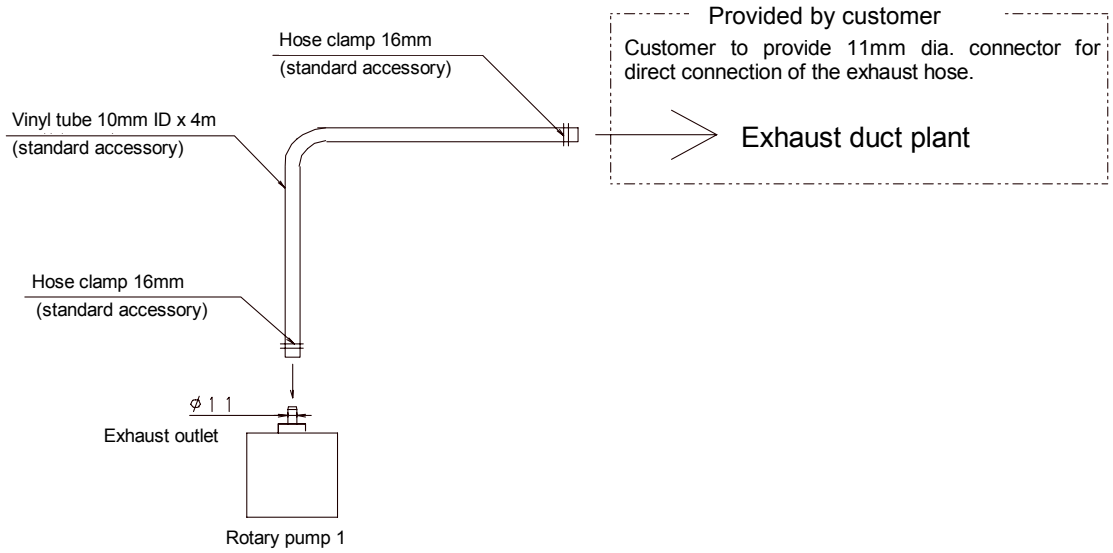
1. Locate the cylinders in a well-ventilated position outside that is not subjected to direct sunlight. Transfer the gas through pipes.
2. Do not allow the cylinder temperature to exceed 40°C. Allow no naked flame within two meters of the cylinders.
3. Ensure sufficient ventilation where high-pressure gas is used. Check for gas leaks with soapy water during the start-up inspection. If flammable gas (such as methane) is used, allow no smoking or naked flame within a 5m range. Provide effective fire extinguishers.
4. Fasten cylinders with chains to ensure they cannot fall over.
5. Use an oilless gas pressure reducer. Do not use pipe with oil on the internal gas-contact surface.
6. Immediately close the cylinder valve when the gas is no longer required.
7. Legal permission is required to store gas quantities of 300m^3, or more. Refer to the High-pressure Gas Safety Law, General High-pressure Gas Safety Regulations, and Fire Protection Law.

6. Exhaust

Provide exhaust duct plant and connect it to the instrument to prevent the discharge of oil mist or injected solvents and sample directly into the room. (See the Exhaust Duct Example below.)
As a guide, the exhaust duct plant should provide a flow of 3 to 20m^3/minute. A normal draft chamber can also be used.

The following oil-mist filter is available for use in situations where provision of an exhaust duct is not possible. If this filter is used, injected solvents and samples are discharged directly into the room.

Cat. No.	Description
042-00124-31	Oil-mist filter EMF3



Exhaust Duct Example

7. Other parts to be prepared

A Shimadzu service technician will adjust the instrument and measure inspection data immediately after the instrument is installed. Please have the following required items available at this time.

1. Capillary column DB-5ms, manufactured by J&W
   ID 0.25mm, length 30m, film thickness 0.25μm GLC Center number: 122-5532
2. Microsyringes for sample injection (e.g., 10μL)
3. Standard sample for instrument evaluation

OFN 1pg (225-09558-02) for evaluation of EI, NCI(OPTION)
Benzophenone 100pg/ul (225-09558-02) for the evaluation of C I(OPTION)I
Cholestane 100ng/ul (225-09391-05) for the evaluation of DI I(OPTION)

4. Other service parts or consumables that the customer considers necessary.
   See the *List of Service Parts and Consumables* for details.

8. Preparation checklist

The checklist on the following pages summarizes the installation conditions described above. The customer is requested to complete this checklist and forward it to Shimadzu.

Customer: _____

_____

Address: _____

Telephone: _____

Item		Condition	Confirmed
1. Installation room	1-1 Temperature Guaranteed within specification Guaranteed operation	 18 to 28˘C (constant) 15 to 35˘C	
	1-2 Humidity	40% to 70%	
	1-3 Installation location Space Strength GC/MS unit approx. 75kg PC unit approx. 20kg * Space at rear Space at left * Weight may vary according to the model of PC, monitor, and printer.	 2000mm (W) x 700mm (D) Able to support weight (approx. 110kg.) 300mm min. 400mm min.	
	1-4 Others	Few harmful elements, such as dust, vibrations, electromagnetic fields, and corrosive gas.	
2. Power supply	2-1 Voltage fluctuations 115V instrument Guaranteed within specification Guaranteed operation 230V instrument Guaranteed within specification Guaranteed operation	 100V±5% 100V±10% 100V±5% 100V±10%	
	2-2 Frequency fluctuations	50/60 Hz ±0.5 Hz within	
	2-3 Terminals * 115V instrument GC unit (Fig. 1) MS unit (Fig. 1) * 230V instrument GC unit (Fig. 1) MS unit (Fig. 1) Separate power supplies are required for the PC, monitor, and printer.	 Cable length Capacity 2m 1800VA 2.5m 1000VA 2m 2600VA 2.5m 1000VA	
	2-4 Grounding resistance	100Ω max.	
3. Gas	3-1 Helium Purity Regulator Pipe between regulator and GC	 99.995% min PPR-He, or equivalent Carrier gas pipe 201-48067 2.5m 201-48067-05 5m 201-48067-10 10m 201-48067-15 15m	

4. Exhaust	4-1 Exhaust duct plant for rotary pump exhaust gases 4-2 Oil-mist filter EMF3 042-00124-31 (option)	Exhaust duct plant required. (Approx. 3 to 20m^3/min.) Required in situations where provision of an exhaust duct is not possible.	
5. Others	The following parts are required: 5-1 Capillary column 5-2 Microsyringes 5-3 Standard sample for instrument evaluation 5-4 Other service parts or consumables	 DB-5ms (example J&W) L 30m I.D 0.25 Film 0.25um 10μL 225-09542-01 For the evaluation of EI (standard), NCI(option) OFN 1pg/μL (isooctane solvent) 225-09558-02 For the evaluation of CI (option) Benzophenone 100pg/ul (acetone solvent) 225-09558-04 For the evaluation of DI (option) Cholestane 100ng/ul (acetone solvent) 225-09391-05 isooctane solvent(for nci, more better)	

List of Service Parts and Consumables (for replacement by customer)

	P/N	Description	Comment	Replacement frequency (guideline)	Class
GC	221-35507-02	SUPELCO SEPTUM (set of 50)		50 units/year (#1)	Consumable
	036-11203-84	FLUORORUBBER O-RING		20 units/year (#2)	Consumable
	221-41444-01	GLASS INSERT (FOR SPLIT)		As required	Consumable
	221-48335-01	GLASS INSERT (FOR SPLITLESS MODE)		As required	Consumable
	221-48600	DEACTIVATED SILICA WOOL		As required	Consumable
	221-48876-03	GLASS INSERT (SILANE FINISHED, FOR SPLITLESS MODE)	Set of 5	As required	Consumable
	221-49065-91	AU PACKING (set of 5)	Set of 1 221-48990	2 units/year	Consumable
	221-34121-93	MOLECULAR SIEVE FILTER		1part/year	Consumable
	221-42559-92	TRAP (SPLIT)		2 units/year (#3)	Consumable
	221-42559-92	TRAP (PURGE)		2 units/year (#3)	Consumable
	201-35183	Aluminum packing (set of 100)	Several required at trap replacement		Consumable
	221-48974	Spacer 1.5	Spacer below septum		Service part
Direct interface	670-15003-03	FERRULE GVF-004 (set of 10)	ID 0.25mm max.	As required (#4)	Consumable
	670-15003-04	FERRULE GVF-005 (set of 10)	ID 0.32mm	As required (#4)	Consumable
	670-15003-07	FERRULE GVF-008 (set of 10)	ID 0.53mm	As required (#4)	Consumable
	670-11009	NUT, SSNE16/012 (set of 5)		As required (#4)	Consumable
Ion source	225-10197-91	FILAMENT	EI/CI/NCI common	2 units/year	Consumable
	225-10446-91	BOX(Heat Treatment)	FOR EI		Service part
	225-10442-91	REPELLER UNIT ASSEMBLY PARTS	FOR EI		Service part
	225-10617-91	BOX,ASSY,CI(Heat Treatment)	FOR CI		Service part
	225-10617-92	BOX,ASSY,NCI(Heat Treatment)	FOR NCI		Service part
	225-10605-91	REPELLER ASSY CI(HT)	CI/NCI common		Service part
	225-10447-91	REPELLER(Heat Treatment)	Only an electrode EI/CI/NCI common		Service part
	016-37575-03	PTFET,7040AMS3653#16	Teflon tube CI/NCI common		Service part
	225-01068	Ceramic bushing	EI/CI/NCI common	As required	Consumable
CI/NCI	202-75101	PIPE ASSY	CI/NCI common(GAS PIPE)		Service part

DI	200-33168	Seal Teflon		As required	Consumable
	036-15550-12	Oring,AS568A-012 4D		As required	Consumable
	225-09344	Sample vacuum bottle		As required	Consumable
	225-04209	cap		As required	Consumable
	225-10627-91	DI PROBE ASSY		As required	Consumable
	225-10618-91	REPELLER2,CI+(C)	IN DI mode ,CI analysis	As required	Consumable
STANDARDSAMPLE	225-09493-03	STANDARD SAMPLE (PFTBA) 5g		As required	Consumable
	225-09493-01	STANDARD SAMPLE (TRIAZINE) 0.5g		As required	Consumable
VACUM SYSTEM	017-30163-11	ROTARY PUMP OIL ULTRAGRADE15 1L	0.28L per oil replacement	1L/year (#5)	Consumable
					Consumable
Tools and jigs	085-35124-03	SCOTCHBRITE (for finishing electrodes) set of 20 sheets		20 sheets/year	
	225-10194-91	JIG, IS			Service part
	225-01453-94	COLUMN MOUNTING JIG (I/F)			
	225-01453-95	COLUMN MOUNTING JIG (INJ)			

#1 Replace after approximately 80 injections.

#2 If carrier gas leaks or when glass insert is replaced.

#3 **Replace periodically, normally once every 6 months. However, replace more frequently under certain measurement conditions or after many analyses of samples with a high boiling-point or samples that are solid at room temperature.**
(See GC System User Guide for details.)

#4 Use when column is replaced.

#5 Ideally, replace oil once every three months (3000 hours operating time). Insufficient vacuum can cause various problems in the mass spectrometer system. The oil must be replaced appropriately.

List of Service Parts and Consumables (for replacement by service technicians)

	P/N	Description	Comment	Replacement frequency (guideline)	Class
GC	221-46260-91	KEY OPERATION UNIT (PCB)			Service part
	078-12130-01	KEY OPERATION UNIT (LCD)			Service part
	221-46470	KEY OPERATION UNIT KEY RUBBER 1 (UPPER)			Service part
	221-46471	KEY OPERATION UNIT KEY RUBBER 2 (LOWER)			Service part
	221-43695-91	THERMAL SENSOR (for column)			Service part
	221-43696-91	THERMOCOUPLE (for column)			Service part
I/F	225-10547	INSULATOR, I/F			Service part
	018-23651	TAPE #973			Service part
	036-11251	O-RING 4D P50			Service part
	225-10549-91	HEATER BLOCK ASSY	100 to 115V, incorporates heater and PT sensor		Service part
	225-10549-92	HEATER BLOCK ASSY	220 to 240V, incorporates heater and PT sensor		Service part
IS	200-44394	CERAMIC INSULATOR, A24-251-1		As required	Consumable
	225-10439-91	HEATER BLOCK ASSY			Service part
	225-10436-91	PT ASSY, IS			Service part
	018-17301	ALUMINUM FOIL		As required	Consumable
	225-10200-91	IS ASSY	LENS, MAGNET, HEATER		Service part
	225-10554-91	CPU, I/F A ASSY			Service part
	034-01602-31	SPRING, SUS UR8-10			Service part
	225-10434-91	CABLE ASSY, F1(S)			Service part
	225-10434-92	CABLE ASSY, F2(S)			Service part
	225-10434-93	CABLE ASSY, F1(L)			Service part
	225-10434-94	CABLE ASSY, F2(L)			Service part
	225-10434-95	CABLE ASSY, L1			Service part
DET	225-10463-91	EM(H) ASSY	Entire detector		Service part
	225-09340-11	EM, AF620	Electron multiplier only	1 part/3 years	Consumable
	225-10466-91	SIG CABLE ASSY, DET			Service part
	225-10466-92	LENS CABLE ASSY, DET			Service part
	225-10466-93	HV CABLE ASSY, DET			Service part

	225-10466-94	CDD CABLE ASSY, DET			Service part
	036-11271	O-RING, 4D P105			Service part
	225-10464-91	FEEDTHROUGH ASSY, CDD			Service part
	225-09148-92	FEEDTHROUGH			Service part
	036-11218	O-RING, 4DP18			Service part
MS FILTER	225-01132	TERMINAL PINS			Service part
	225-10407-91	CABLE ASSY, MS FILTER			Service part
	225-10408-91	SHORT CABLE 1, PRE-ROD			Service part
	225-10408-92	SHORT CABLE 2, PRE-ROD			Service part
	036-11266	O-RING, 4DP90			Service part
	225-09148-92	FEEDTHROUGH			Service part
	036-11218	O-RING, 4DP18			Service part
	225-01373	SHORT SPRING			Service part
	225-10390-01	TERMINAL PLATE (PRE)			Service part
	225-10400	PRE-ROD			Service part
	225-10401	INSULATOR			Service part
	225-10402	SCREW (PRE)			Service part
	225-10403	COLLAR			Service part
SI	225-10179-91	VALVE ASSY, SI			Service part
	225-01559-91	CAPILLARY ASSY			Service part
	035-62971-05	SLEEVE SET, 1/16F-T		As required	Consumable
	225-04257-91	GLASS SAMPLE BOTTLE (set of 5)			Service part
	036-11203	O-RING, 4DP5			Service part
Vacuum system	225-09490-01	IG GAUGE		1 part/3 years	Consumable
	200-47686-02	PB1 PIRANI TUBE FILAMENT		1 part/3 years	Consumable
	225-09508-02	TURBOVAC TW300	TMP unit	Overhaul every 3 years (#2)	Service part
	225-09508-03	TURBO DRIVE.S (TW300)	TMP controller		Service part
	225-09509-02	TURBOVAC TW70H	TMP unit	Overhaul every 3 years (#2)	Service part
	225-09509-03	TURBO DRIVE.S (TW70H)	TMP controller		Service part

	225-09517-01	RP E2M1.5(100-200)	No cable	Overhaul every 1.5 years (#3)	Service part
	225-09517-02	RP E2M1.5(220-240)	No cable	Overhaul every 1.5 years (#3)	Service part
	225-11446-91	CABLE, MS-RP	RP cable		Service part
	221-09895-09	LABEL, AC220 240V	Label for cable		Service part
	221-09895-10	LABEL, AC110 115V	Label for cable		Service part
	210-13532-71	LABEL, RP1	Label for cable		Service part
	204-30020	HOSE NIPPLE, 16KF-18 HOSE			Service part
	035-06004-51	CENTER RING, KF10/16SNRCR			Service part
	035-02402-01	CLAMP RING 10/16KF			Service part
	016-31697-03	HOSE, CHEMIFLEX 19MM			Service part
	037-61024	HOSE CLAMP, HB-1-28			Service part
	017-30290-11	LUBRICATING OIL, BARRIERTA IS/V75		As required	Consumable
	225-03538-91	ELBOW, KF16-#15			Service part
	035-06004-22	CENTER RING, KF16SVCR			Service part
	035-02411-21	CENTER RING, 32036-PAZV			Service part
	035-02411-22	CENTER RING, 32040-PAZV			Service part
	036-11271	O-RING, 4D P105			Service part
	225-10125	FEEDTHROUGH 12P			Service part
	036-11243	O-RING, 4D P40			Service part
	225-10116-91	LEAK VALVE ASSY			Service part
	036-11203	O-RING, 4D P5			Service part
Main power	225-11260-91	MAIN POWER ASSY			Service part
	074-80422-01	POWER SUPPLY, LEA50F-5			Service part
	074-80422-51	POWER SUPPLY, LEA50F-24			Service part
	074-80424-01	POWER SUPPLY, LEA150F-24			Service part
	225-11360-91	PCB ASSY, LED-A			Service part
	225-11350-91	PCB ASSY, PUMP CTRL-A			Service part
	225-10333-91	FAN ASSY, POWER			Service part
HV PCB	225-11195-91	HV PCB ASSY			Service part
	225-11195-92	HV PCB ASSY,NCI			

RF PS	225-11075-91	RF PS ASSY			Service part
	225-11060-91	PCB ASSY, RF DIFF-A			Service part
	225-10296-91	FAN ASSY			Service part
MAIN CTRL	225-11130-91	PCB ASSY, MAIN CTRL-A			Service part
CPU PCB	225-11000-91	PCB ASSY, CPU-A			Service part
IS CTRL	225-11225-91	IS CTRL-A ASSY			Service part
DC POWER	225-11250-91	DC POWER-A			Service part
IG CTRL	225-11280-91	PCB ASSY, IG CTRL-A			Service part
PRE AMP	225-11030-91	PCB ASSY, PRE AMP-A			Service part
DI	225-11310-91	PCB ASSY, DI CTRL-A	DI IPTION		Service part
	225-11300-91	PCB ASSY,DI SOCK-A	DI IPTION		Service part
	225-11325-91	RELAY BOX 100V	DI IPTION(100/115V)		Service part
	225-11325-38	RELAY BOX 230V	DI IPTION(220-240V)		Service part
CI/NCI	225-10576-91	CI GAS CONTROLLER	CI/NCI OPTION		Service part
	225-10603-91	ELBOW,KF16-#15,CI	CI/NCI OPTION		Service part
CABLE	071-60814-05	CORD, KP-4819D+KS31A	(220 to 240V)		Service part
	071-60815-04	CORD SET, KP300C+KS16*	(100 to 115V)		Service part
	070-60311-02	CABLE, AXJ231122	(IEEE-1394)		Service part
	070-60311-03	CABLE, AXJ231132 (4.5m)	(IEEE-1394)		Service part
	088-50906-11	CABLE, KRS-403XF1K	(RS-232C)		Service part

#1 **Once every 3 years is sufficient, unless some unforeseen accident occurs.**
This is an expensive part and having one available can avoid sudden expenditure. However, storage over a long period is not recommended, as the detector deteriorates if unused for long periods.

#2 Overhaul required every 25,000 hours (approx. 2.8 years).

#3 Overhaul required every 15,000 hours (approx. 1.7 years).

5.Installation Completion Checksheet

Shimadzu Gas Chromatograph Mass Spectrometer

GCMS-QP2010

Name: _____

Department: _____

User's name: _____

I have checked the items in the attached checklist and report that the installation is complete.

Installation completion date: _____

Installation supervisor: _____

Department: _____

Model name	Serial number
GCMS-QP2010	C7026

Remarks

.....

.....

.....

ZEAV-0416A

Shimadzu Corporation

2010 Installation Completion Checklist

The items relate to acquiring installation completion data and conducting operation checks.
Installation is complete when all items in the installation completion checklist have been checked and the operation instruction completed. (A standard installation requires four working days.)
Analysis of the customer's samples is **separate from the installation process**.

Checklist

No.	Check Item	Check Details and Conditions	Criteria	Check	Comment
1	**Installation conditions**	Power supply:120/ 220/230/240V	within ±5%	☐	(V)
		Check supply capacity (see System User Guide)	Greater than indicated value.	☐	(A)
		Grounding (100Ω max.)	Grounded	☐	
		Location:			
		Space designated in System User Guide available?	Available	☐	
		Check strength of table (able to support 100kg?)	No flexing or vibrations	☐	
		Temperature:			
		Check ambient conditions at installed location.	within 23±5˚C	☐	
		Gas (Helium purity and pressure regulator)			
		He purity	99.995% min.		
		Designated pressure and contamination check	No abnormality in analysis data	☐ ☐	
		Exhaust:			
		Is RP exhaust outlet connected to exhaust outside the building or is an oil-mist filter used?	Yes	☐	
2	**Operation checks**				
	a. Basic operation	* Do the RP/TMP start normally with the GCMSsolution startup program? (Automatic start completes within 5 minutes?)	Normal	☐	
		* Normal communication with GC using the GCMSsolution GC parameters?	Normal	☐	
		* Temperature control of INJ, OVEN, I/F units?	READY lamp does not go out	☐	
	b. Explanation	* Explain MS, MC, and SIM measurement using OFN 100pg/μL standard sample (tuning, creating methods, analysis, batch processing, data re-analysis, outputting reports).	Operation explained	☐	
3	**Function checks**				
	a. Tuning	* Peak intensity fluctuates when each lens voltage is changed in the tuning window.	Fluctuates	☐	
		* Detector voltage stabilizes at -1.8kV or below after auto-tuning? (This checks the ion-source operation, SI sample injected volume, and detector performance.)	-1.8kV or below	☐	
		* Discrepancy in peak amplitudes within 0.1M after auto-tuning?	Within 0.1M	☐	
		* When pattern correction is selected m/z502 intensity over 2% of m/z69 intensity? Keep auto-tuning data.	Over 2%	☐	

	b. Mass spectra measurements (MS, MC)	* Take and keep mass spectrometer (MS) and mass chromatogram (MC) sensitivity measurement data from practical operation. Measurement conditions shown below. (This checks the operation of the MS and MC software.)	Normal operation	☐	
	c. Selected ion measurement (SIM)	* Keep SIM data from practical operation. (This checks the operation of the SIM software.)	Normal operation	☐	
4	**Performance checks （EI）** a. Resolution	* After auto-tuning, change the RF offset value to sharpen the peaks. Check m/z69, 219, 502 peak amplitudes do not exceed 0.5M. (At least 2M resolution at FWHM 0.5 max.)	2M resolution min.	☐	
	b. Sensitivity （EI）	* Conduct MC measurement at m/z272 on OFN 1pg/μL (1ppb) standard sample. Confirm S/N≥60 (RMS).	As described at left	☐	
	c. Mass marker	* Auto-tuning results give PFTBA peaks (m/z69, 131, 219, 264, 414, 502, 614) within ±0.1 mass.	As described at left	☐	
	Performance checks（PCI） a.Autotuing	Autotuning should be completed without problems (detector gain <1.5kV) Intensity ratio; I(29)/I(17) > 0.2 for methane I(57)/I(43) > 1 for iso-butane PFTBA spectrum should be obtained		☐	
	b. Sensitivity	Conduct MC measurement at m/z183 on Benzophenone 100pg/μL (100ppb) standard sample. Confirm S/N≥150 (RMS).		☐	
	Performance checks （NCI） a.Autotuing	Autotuning should be completed without problems (detector gain <1.6kV for NCI, <2.2kV for SEI, <1.5kV for SCI) NCI : The m/z 633 peak for PFTBA should be a base peak The following peaks of PFTBA should be observed for NCI : m/z 264, 333, 414, 452,514,595,633		☐	
	b. Sensitivity	Conduct MC measurement at m/z272 on OFN 100fg/μL (100ppt) standard sample. Confirm S/N≥100 (RMS).		☐	
	Performance checks （DI） **Tem cont**	**Carry out temperature adjustment on the set-up temperature conditions.** RommTemp-40℃/min-300℃ Sample Cholestane 100ng/ul(100ppm) 1ul M/Z217 BeasePeak,M/Z372molequrePeak		☐ ☐	
5	**Accessories**	Check correct standard accessories are supplied (according to list in the System User Guide)	Correct accessories	☐	

Measure S/N.(EI MODE and NCI MODE)

EI SAMPLE OFN 1pg/ul (isookutane solvent) 1ul m/z272 S/N≧60
NCI SAMPLE OFN 0.1pg/ul(100fg/ul)(isookutane solvent) 1ul m/z272 S/N≧100

Measurement Conditions

INJ	250℃	
	SPLITLESS mode (sampling time 1.0 minute)	
COL:	50℃ (1min) - 40℃ / min - 200℃ (0min) - 15℃ / min - 280℃	
I/F:	250℃	
IS:	200℃	
He:	during injection 250kPa, 1 minute (HIGH-PRESSURE INJECTION mode)	
	during analysis 120Kpa	
Total flow:	50mL/minute	
MS:	SCAN mode (mass range: m/z200 to 300)	
	interval 0.5s	
	detector voltage relative value: +0.4	(absolute value: 1.4 to 1.6kV)
	measurement time: 3.0 to 10.0 minutes	(solvent elution time: 3 minutes)

Measure S/N.(CI MODE)

Benzophenone 100pg/ul (acetone solvent) 1ul m/z183 S/N≧150

Measurement Conditions

INJ：	250℃	SPLITLESS MODE (Sampling Time 2.0 min)
COL：	80℃（2min）－30℃／min－260℃（5min）	
I／F：	250℃	IS：200℃
He：	during injection and analysis	100Kpa
Total flow	20ml/min	
MS：	SCAN MODE （mass range M/Z 100～250）	
	interval 0.5sec	
	detector voltage relative value +0.4	（absolute 1.4～1.6 kV）
	measurement time 6.0～11.0 min	（solvent elution time 5.5min）

Reference pressure of the reagent gas in the installation at the time of corporate identity, NCI use

Methane gas	CI 100Kpa～300Kpa	NCI 200Kpa～300Kpa
Isobutane gas	CI 20Kpa～80Kpa	NCI 40Kpa～80Kpa
Ammonia gas	CI 100Kpa～300Kpa	NCI 200Kpa～300Kpa

mass patern check Measurements DI MODE
Carry out temperature adjustment on the set-up temperature

cholestane 100ng/ul (acetone solvent) 1ul

Measurement Conditions

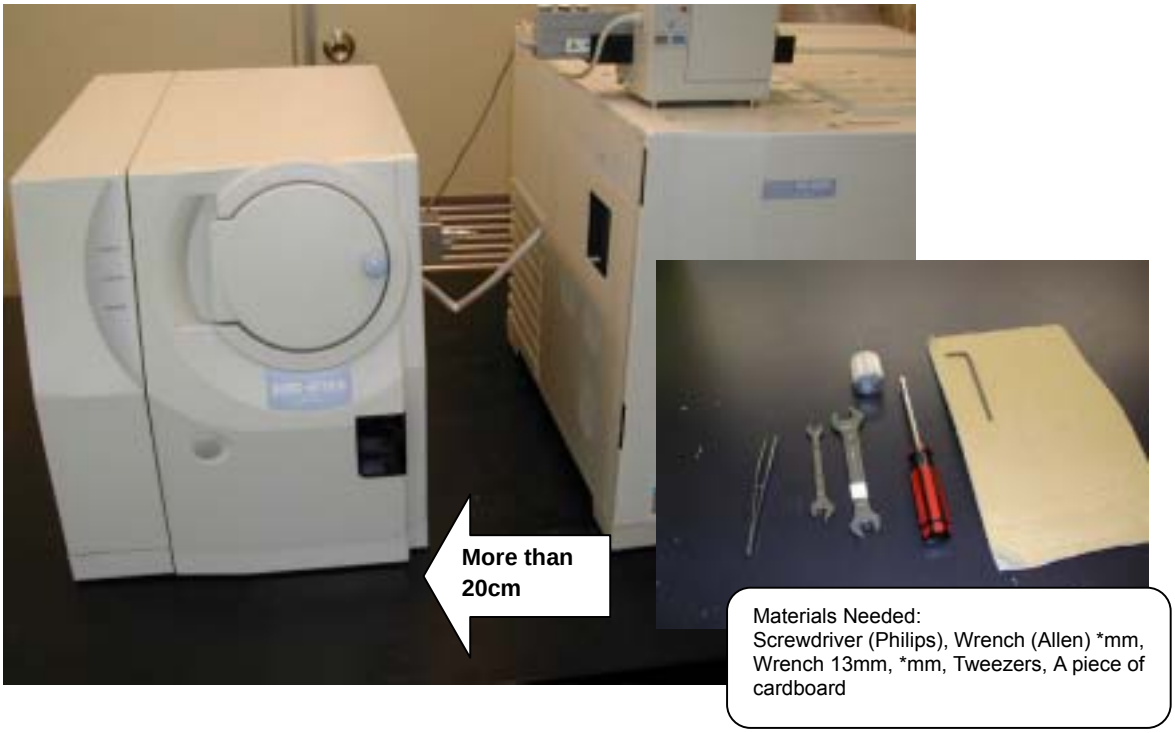
MS I/F 100℃
IS 250℃

DI temperature room temperature to 300℃ 40℃ / min
GC temperature constant
Colum flow moderate flow

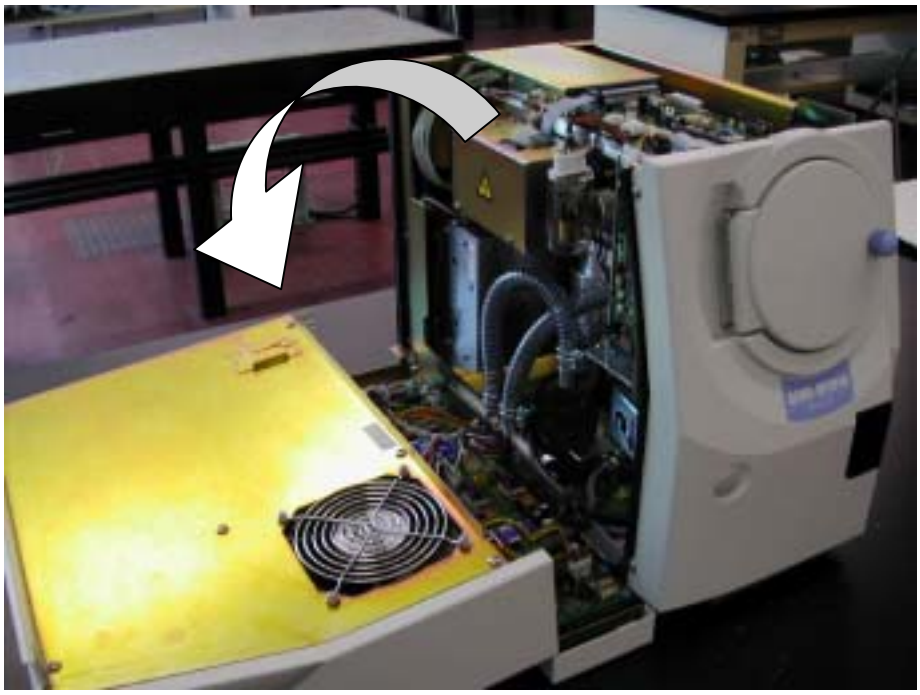
6. How to change Turbopump

Replacement Procedure of Turbomolecular Pump TW300 ~ QP2010 ~

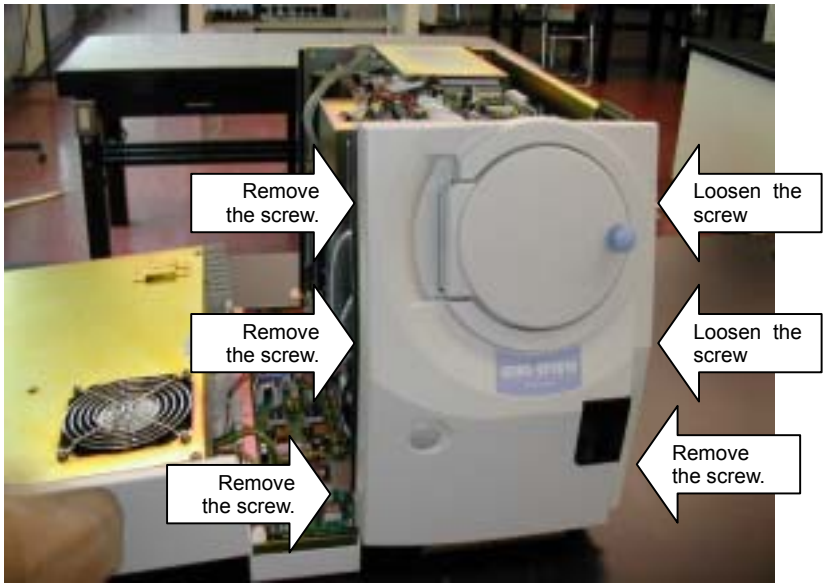
1. Shut down QP2010 and turn off the power. Remove capillary column from interface and separate MS part from GC part more than 20cm. Disconnect the control cable for interface temperature. If MS part cannot be kept enough distance from GC part, move MS part to another work table after disconnecting all the cable from MS part.



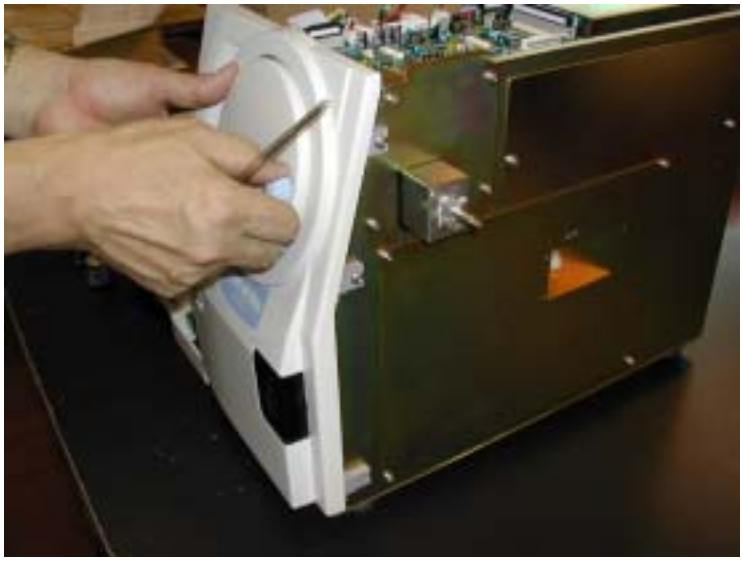
2. Remove the top cover and lay down the power unit box.



3. Remove the front cover.



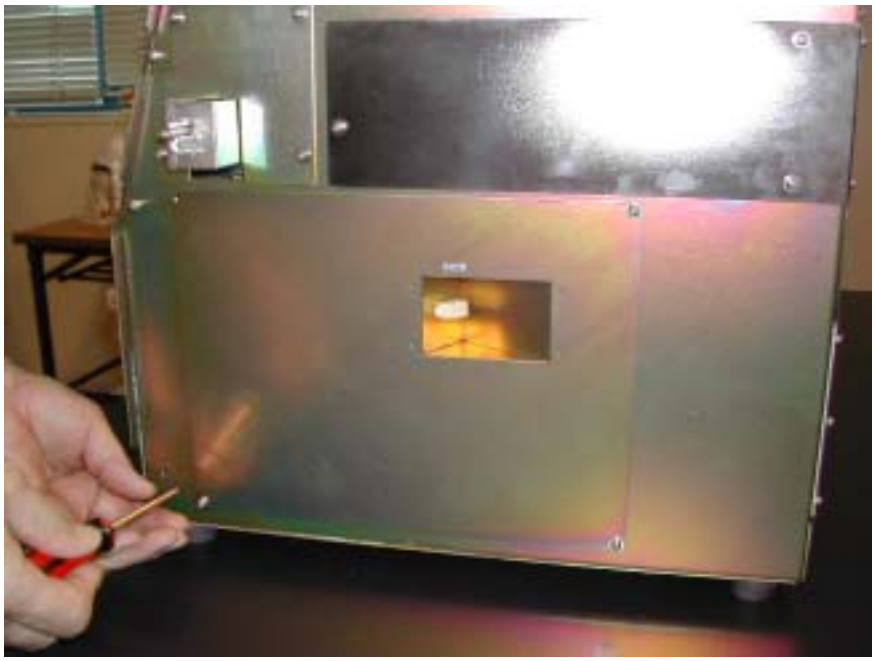
Loosen the screws at the both sides of cover.



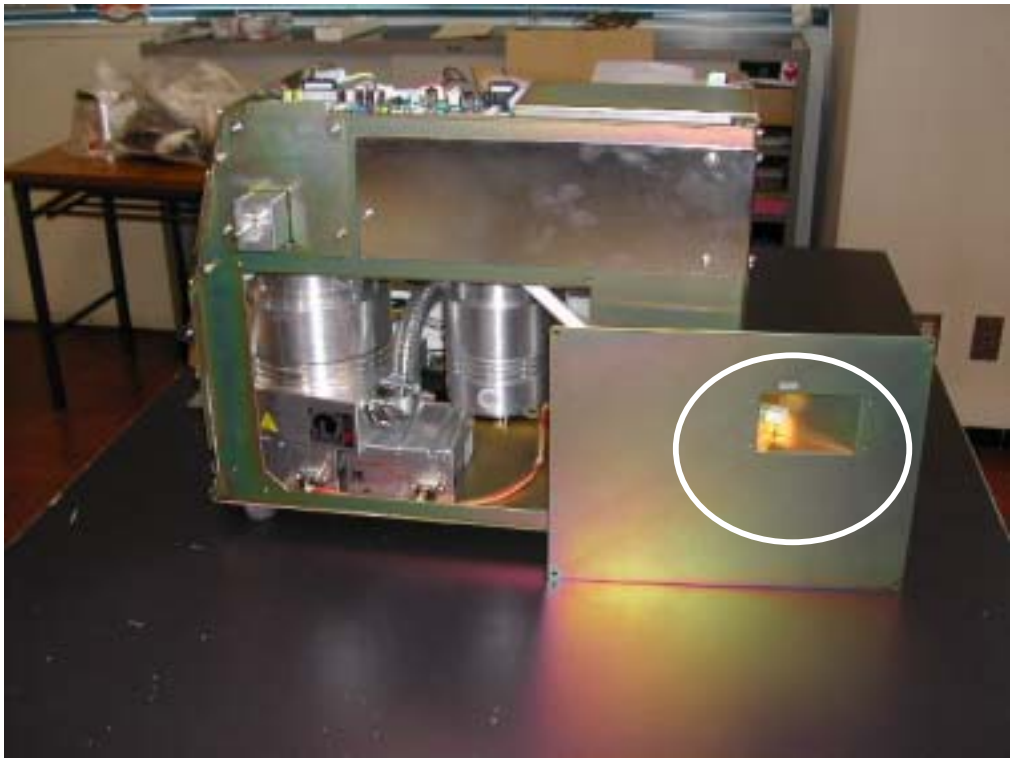
Remove the front door.

Remove the cover.

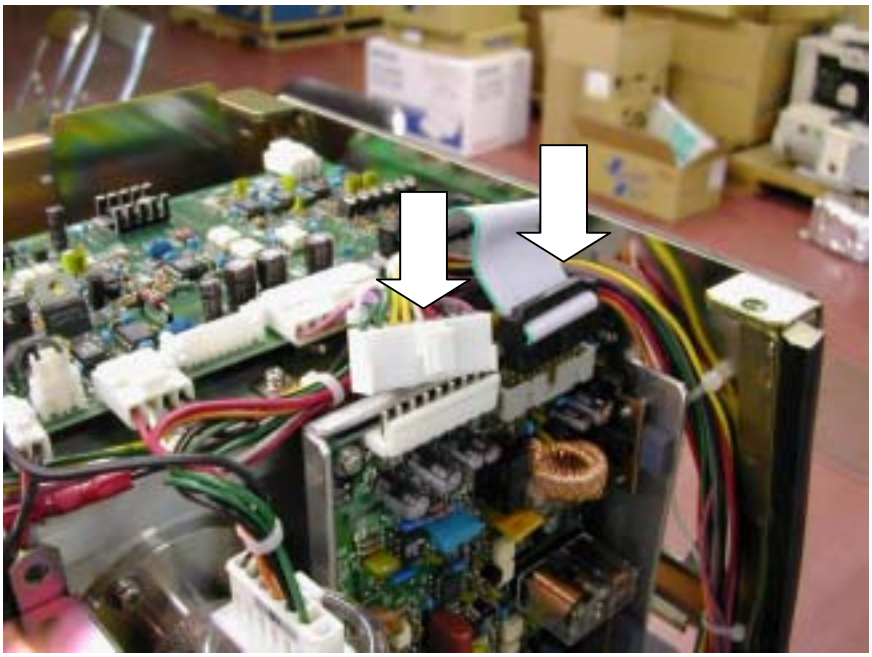
4. Remove the right side panel.



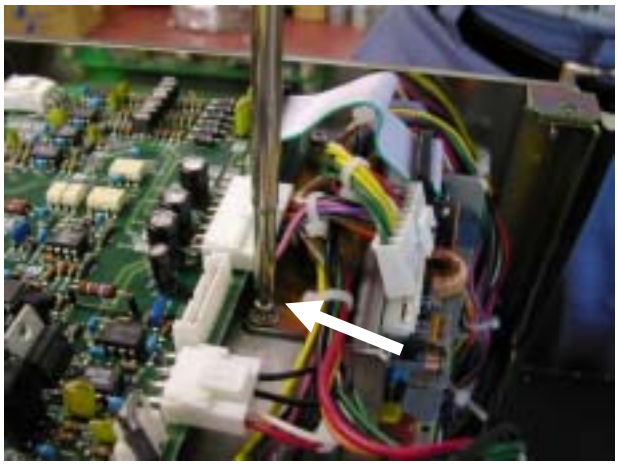
The above work can be easily done by previously removing the connector for interface heater. (The connector can be easily removed by clipping its both side with your fingers)

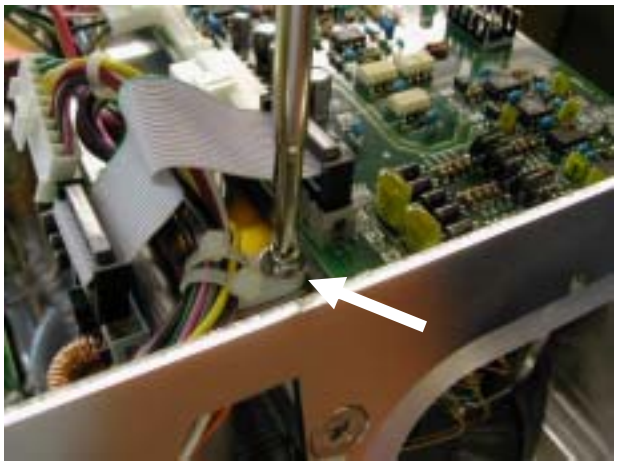


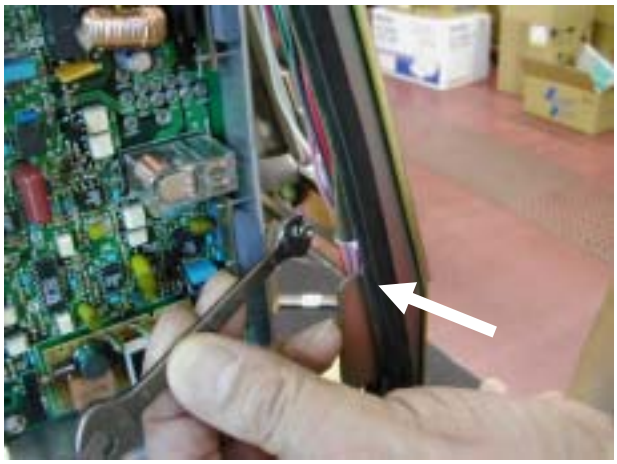
5. Remove the IS CTRL-A Board Unit.
Disconnect the two connectors.



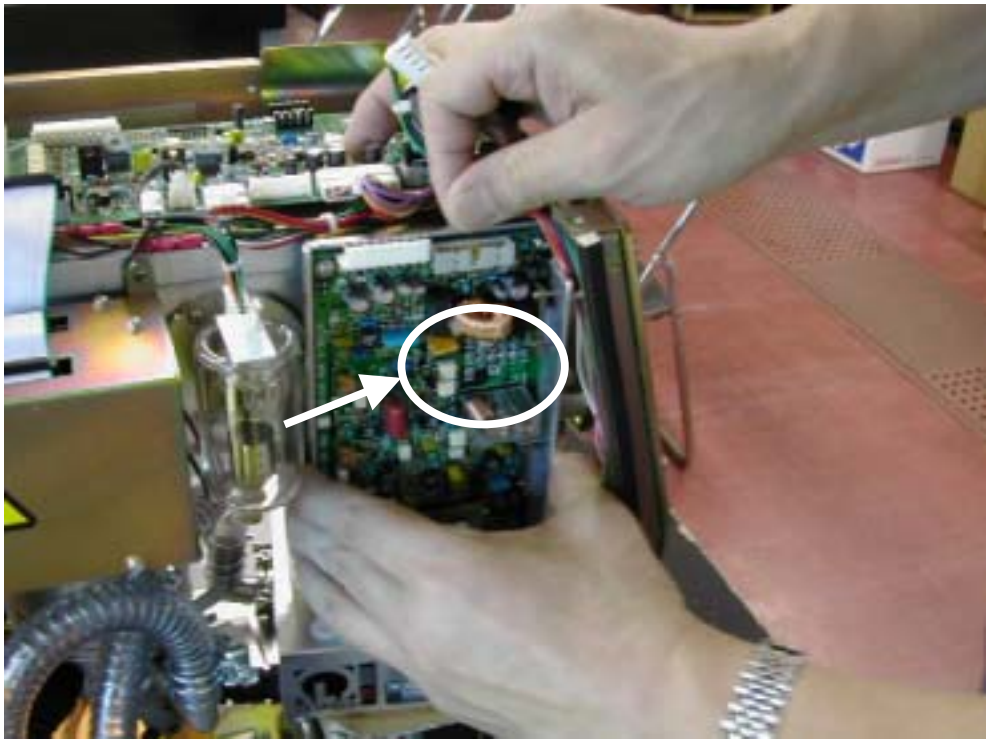
Remove the three screws and the spacer screw



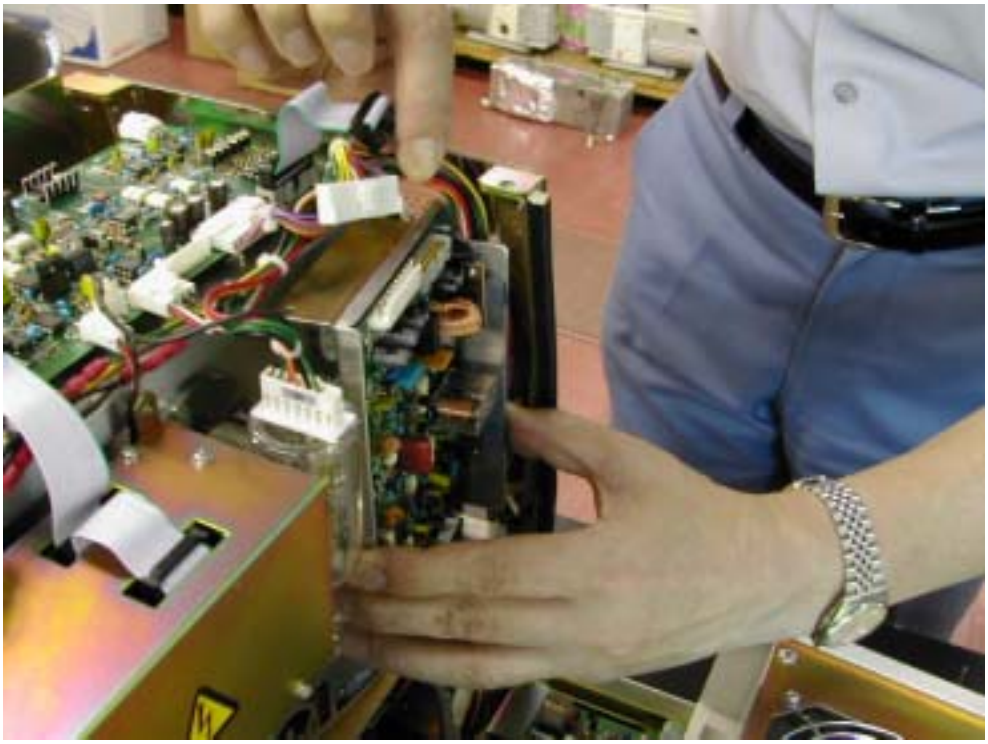




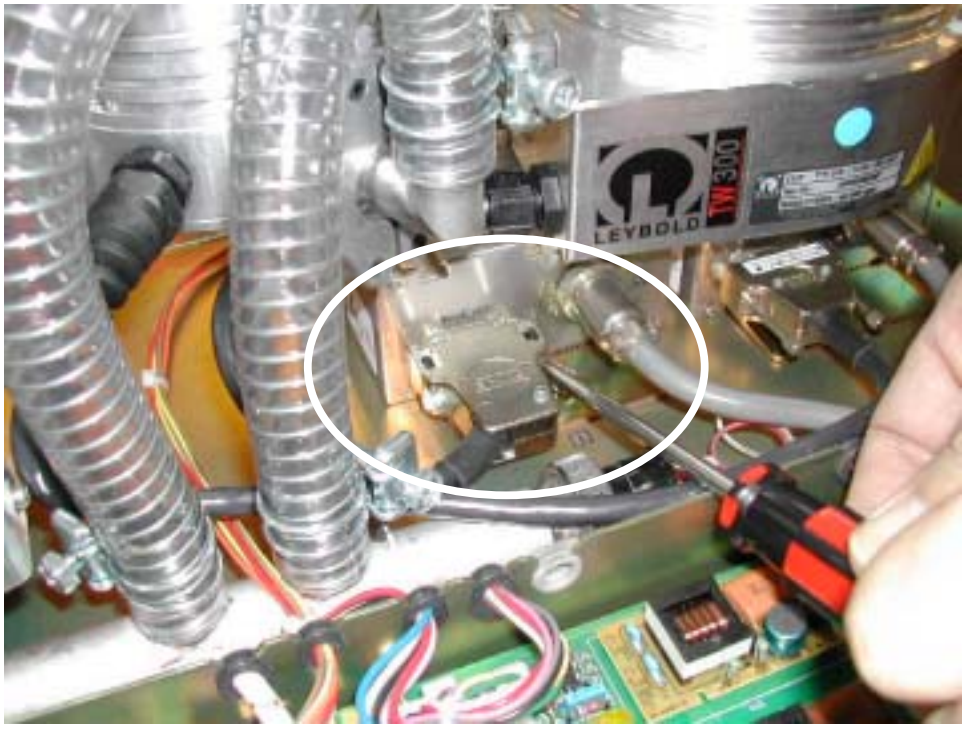
Disconnect the feedthrough connection, indicated by arrow, by holding the IS CTRL-A board in both hands. (Be careful not to put insufficiently strong power into the feedthrough)



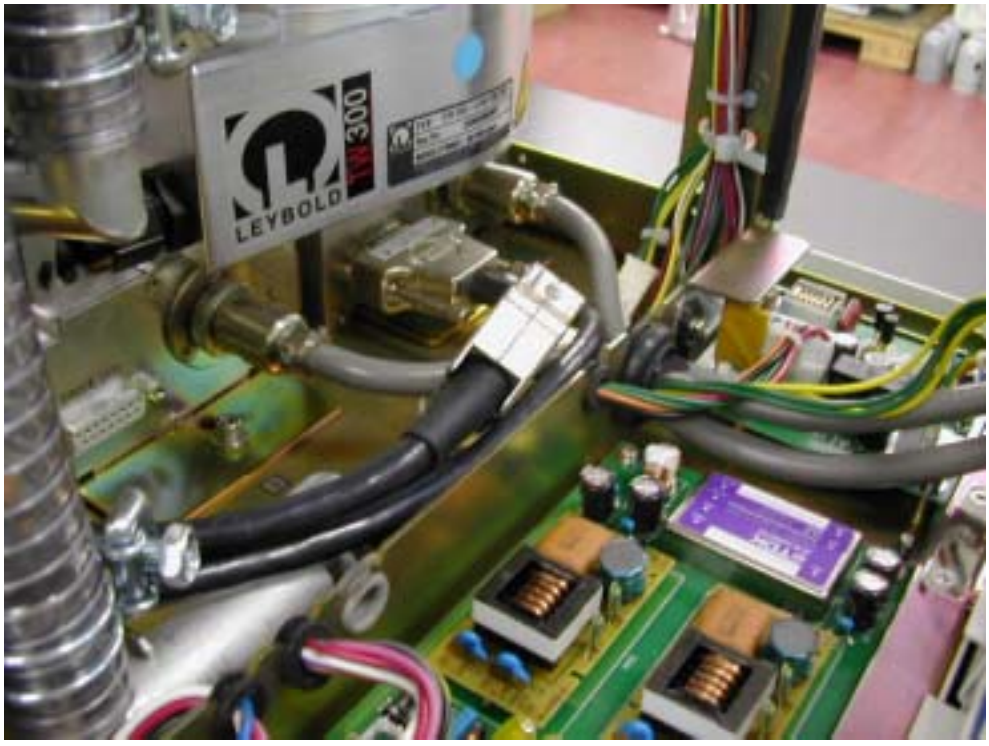
Put wires aside and remove the IS CTRL-A board unit.



6. Disconnect the connector from the power supply for TW300, which is the rear one of the two power supplies for turbomolecular pump.



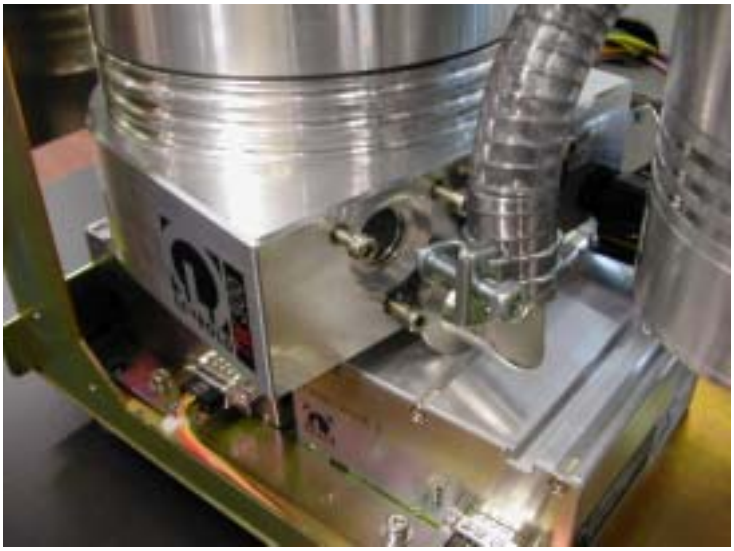
(After removing the cable)



7． Remove the outlet flange of TW300.

Loosen three screws.

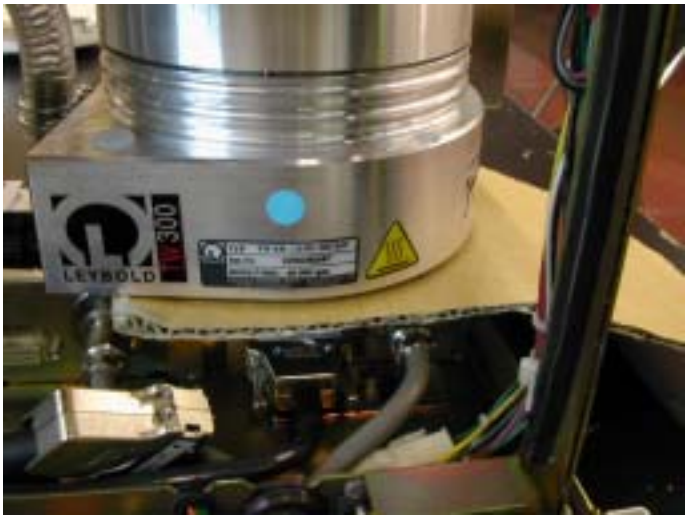
Slide the presser plate the arrowhead to remove it.



Remove the flange and the o-ring. (Be careful to avoid dust)

8. Remove TW300.

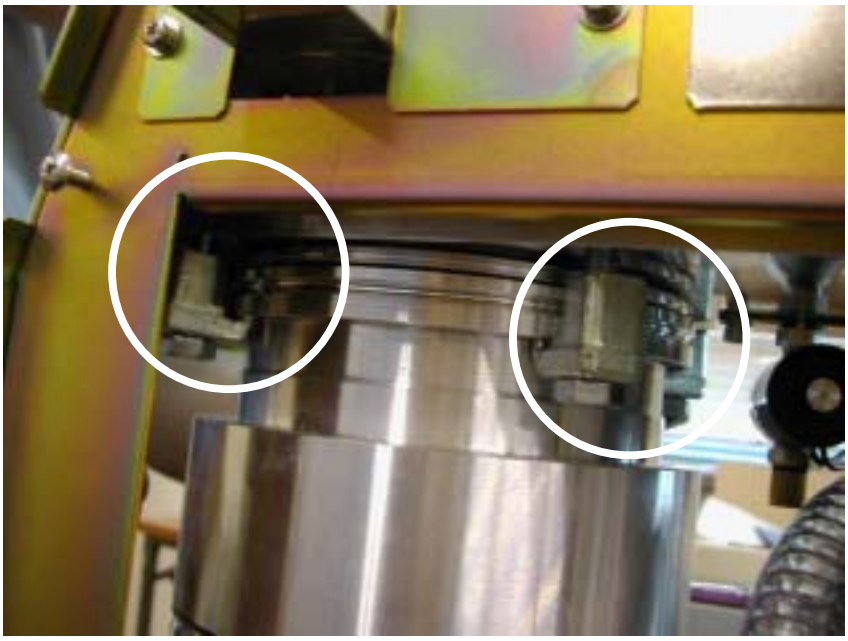
Put cardboard between the TW300 main body and the power unit. (This procedure will make the later work easier.)



Loosen gradually the diagonal 4 fixing screws. (Do not remove the screws at this step.)

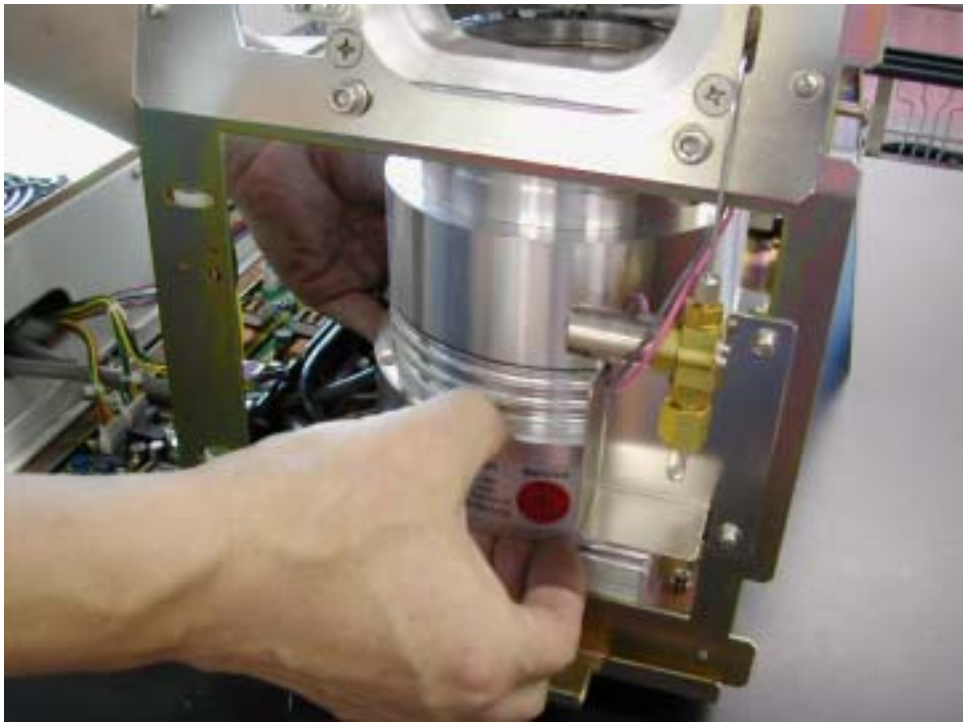
The front-left side screw can be loosened by putting the wrench into clearance, as shown in the picture. Do not remove the SUS tube from SI solenoid valve.

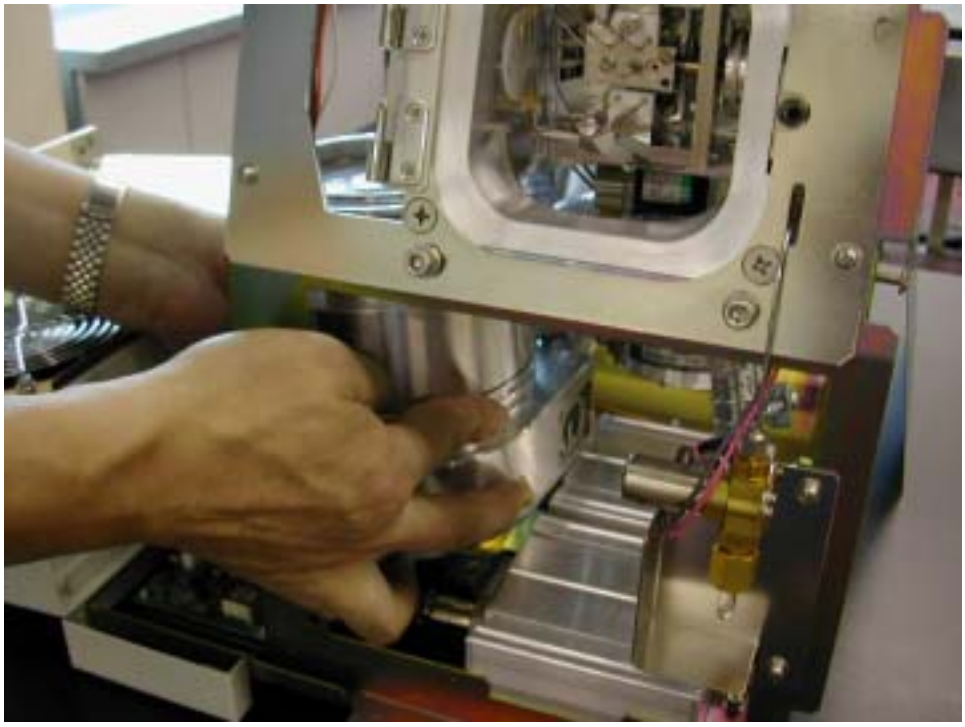
Do not remove the 2 screws on the right side.



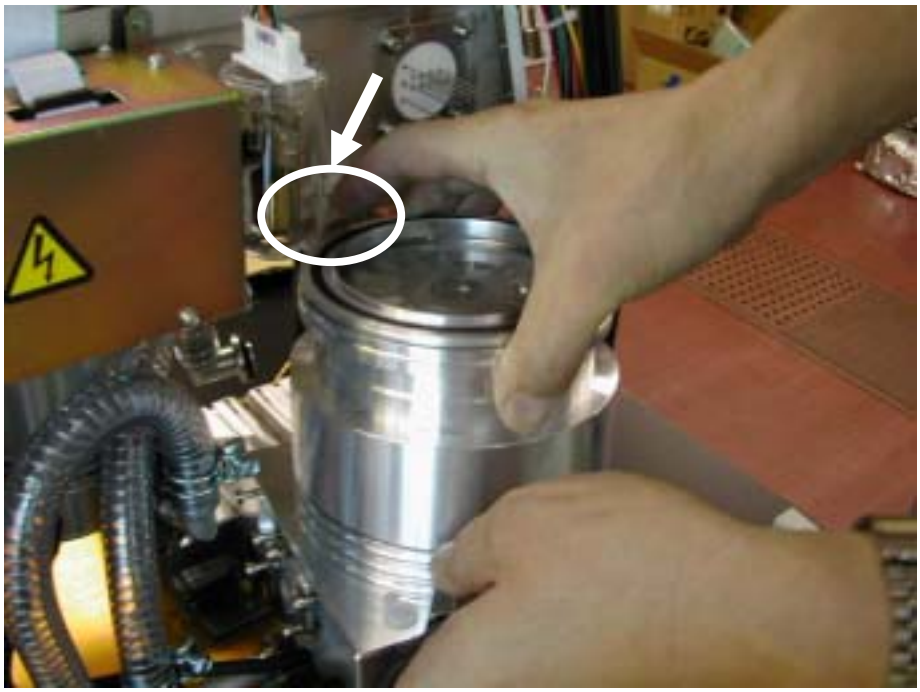
Remove the 2 screws on the left side.

Remove cardboard.
Move the TW300 left by holding in both hands.

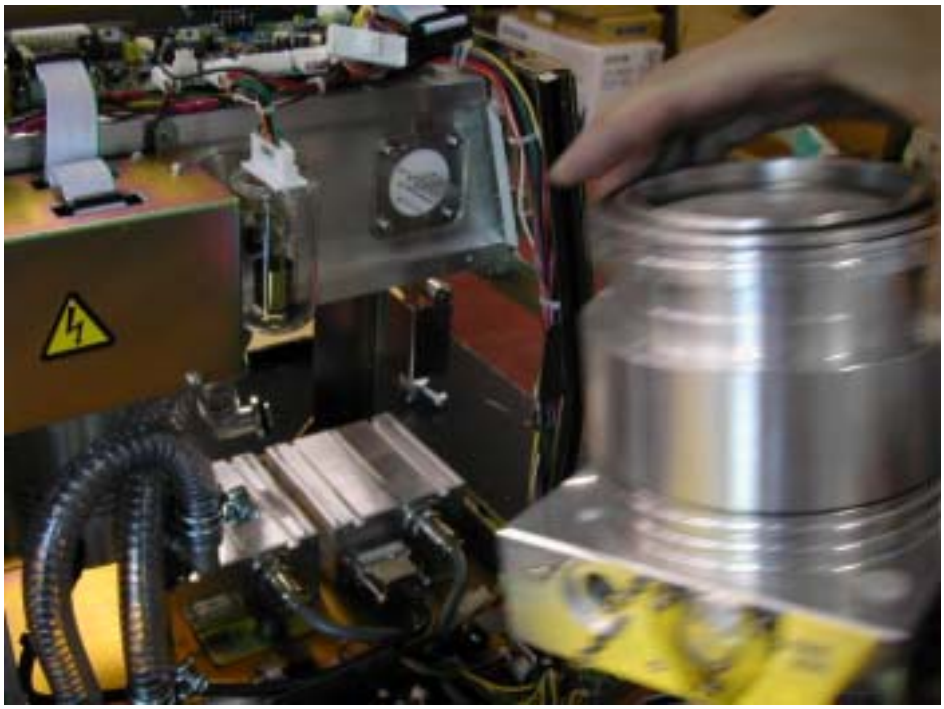




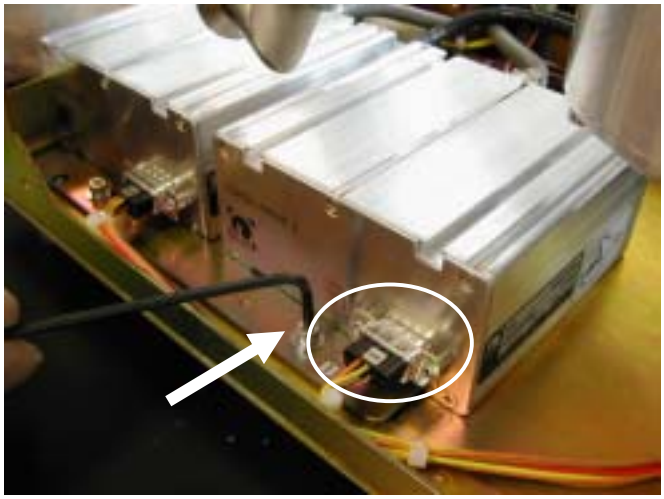
Take out the TW300 by supporting securely its bottom side and its inlet part. Be careful not to hit and broke the IG gauge, indicated by arrow. (Work with clean hands. We recommend you to wear clean gloves.)

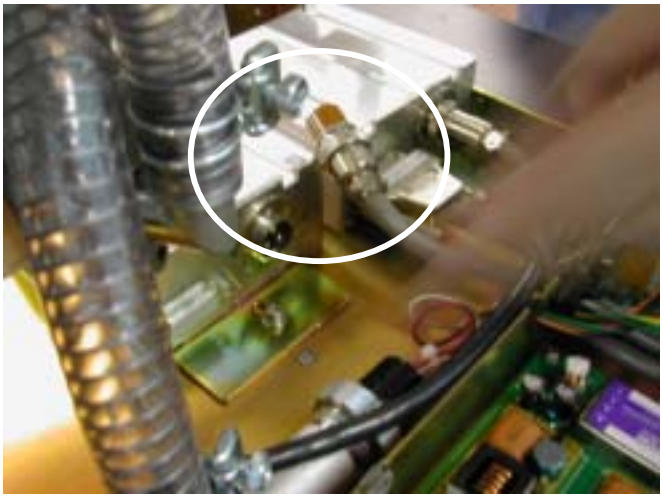


Completion of removal

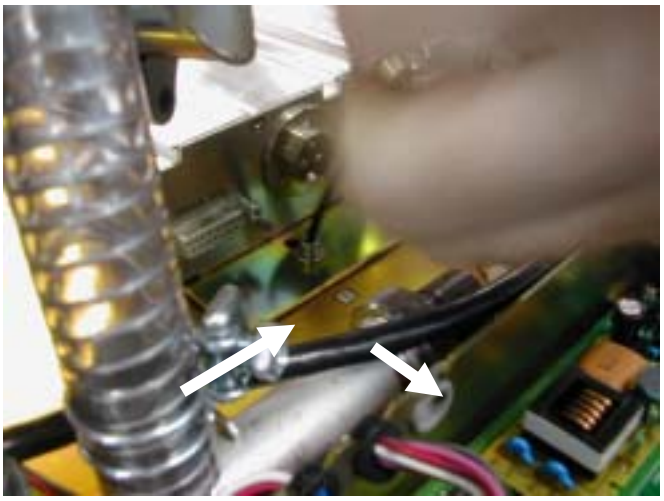


9. Replacing the power unit.





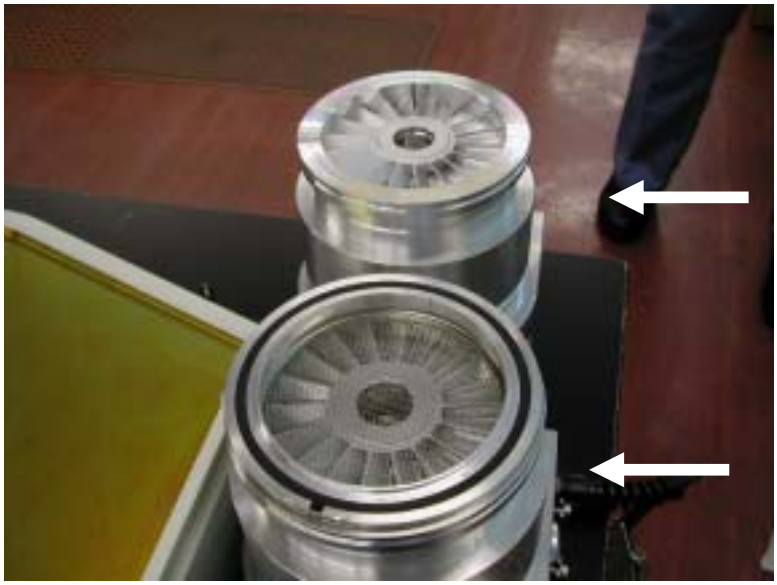
Loosen the fixing screw, indicated by arrow. Disconnect the two connectors.



Loosen the fixing screw and slide the presser plate to remove the power unit.

Install the new power unit, TURBO DRIVE 300. The 'REMOTE' terminal will be used. Do not use the 'SERVICE' terminal.

10. Preparation of new TW300



New TW 300

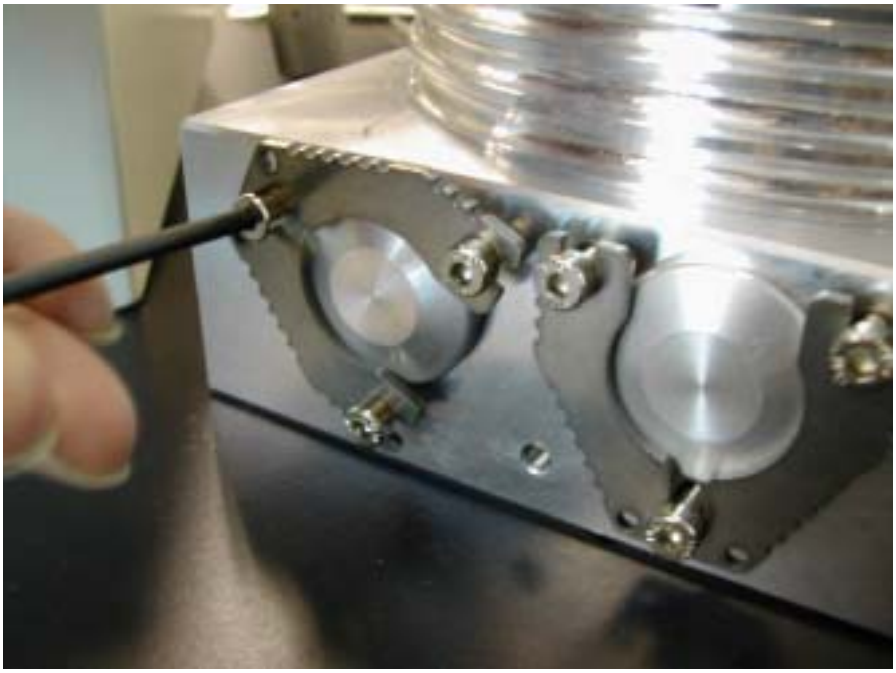
Removed TW300

Check the name plate.

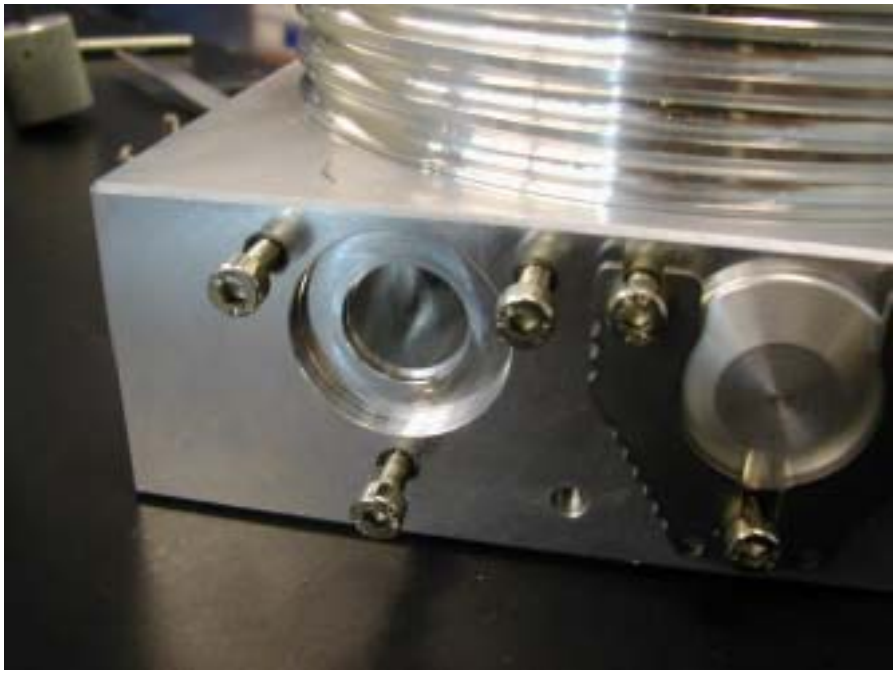
Old type

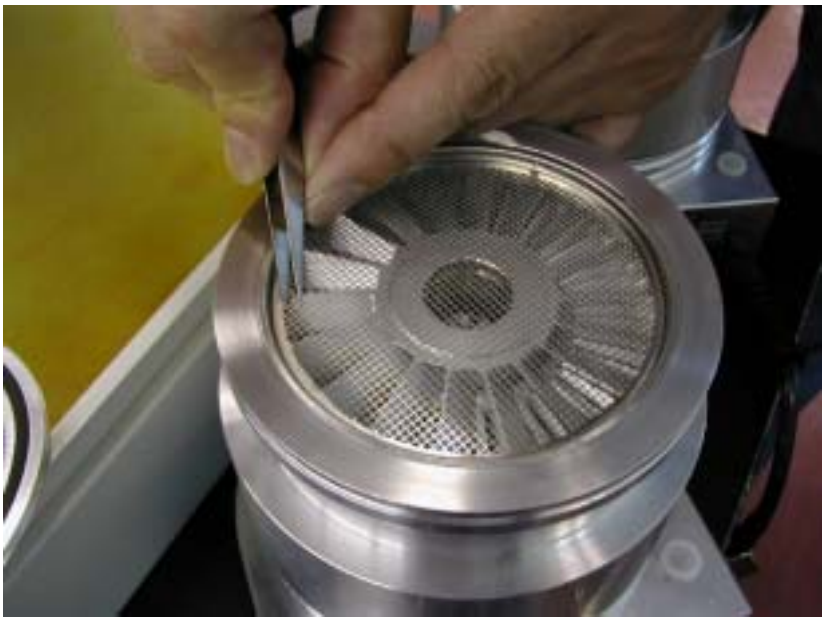
New type

Remove the cap of outlet. Loosen the 3 fixing screws and remove the plate



Remove the o-ring.





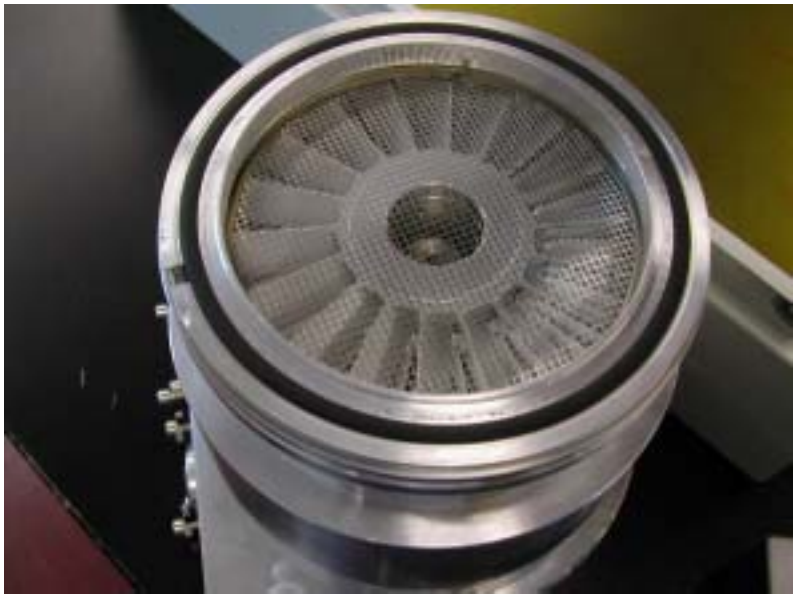
Remove the o-ring and the protective net from the removed TW300 for reuse. You can remove the protective net by hooking it with tweezers. (We recommend you to wear clean gloves.)

If it is difficult for you to remove the protective net, try to hook the fringe of it. (Put a sheet of paper or like that on the contact surface with o-ring not to scratch or injure.

Remove the protective net.

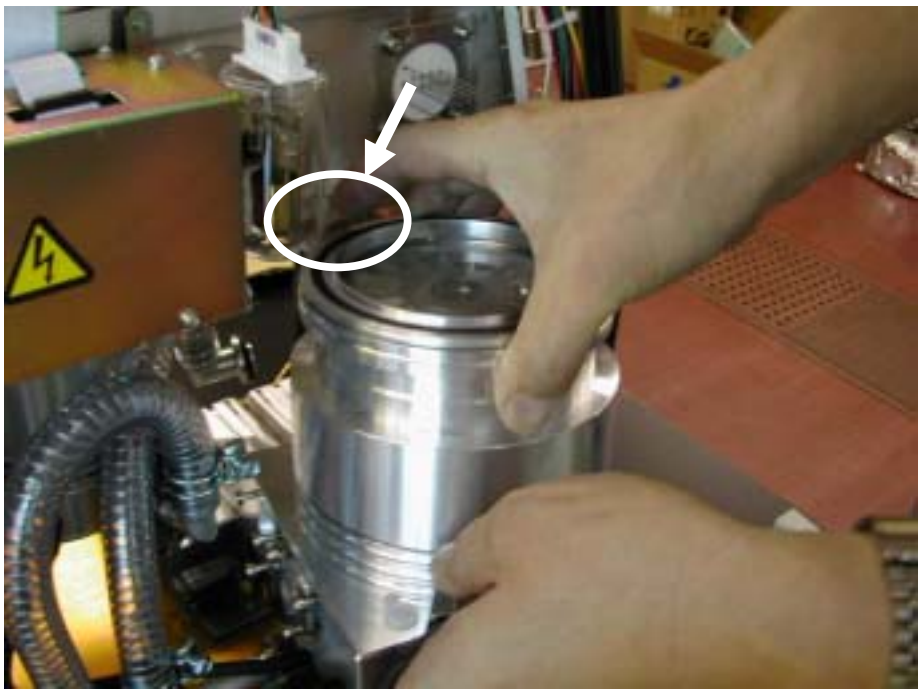
11. Installing the new TW300

Place the protective net and the o-ring in the new TW300. Make sure that there is no dust on sealing surface, o-ring and protective net. Make sure that there are no dust and no scratches on sealing surface of vacuum manifold



Put cardboard on the power unit of turbomoecular pump.

Reinstall TW300 in a reverse way of removal. Pay attention not to hit against the IG gauge.

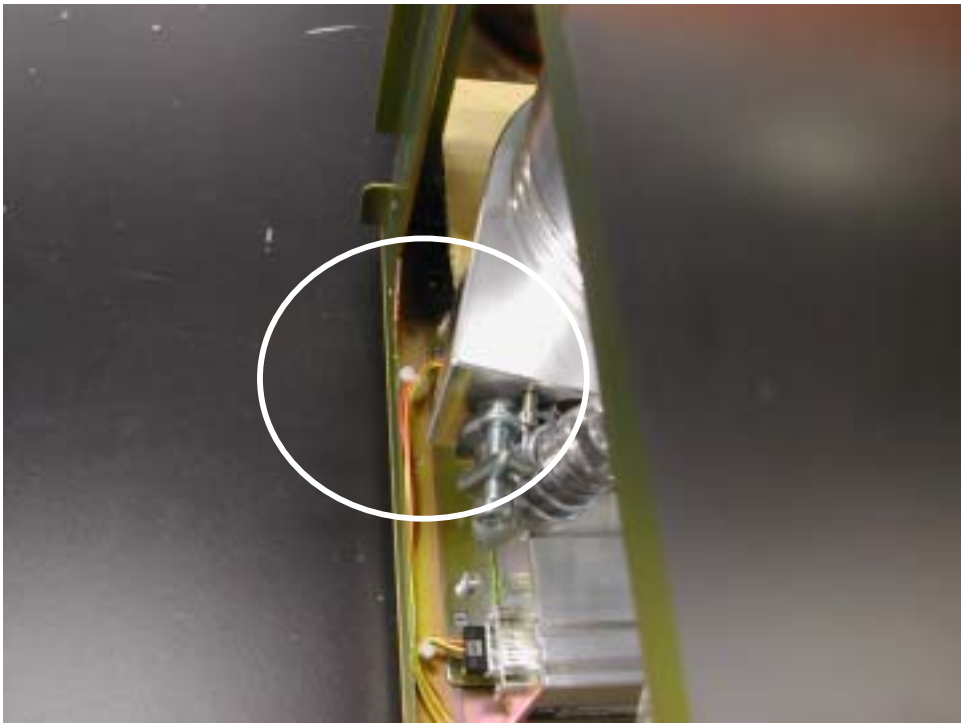


Hook the right side hooks on the neck of inlet.

Attach the left side screws and hooks.

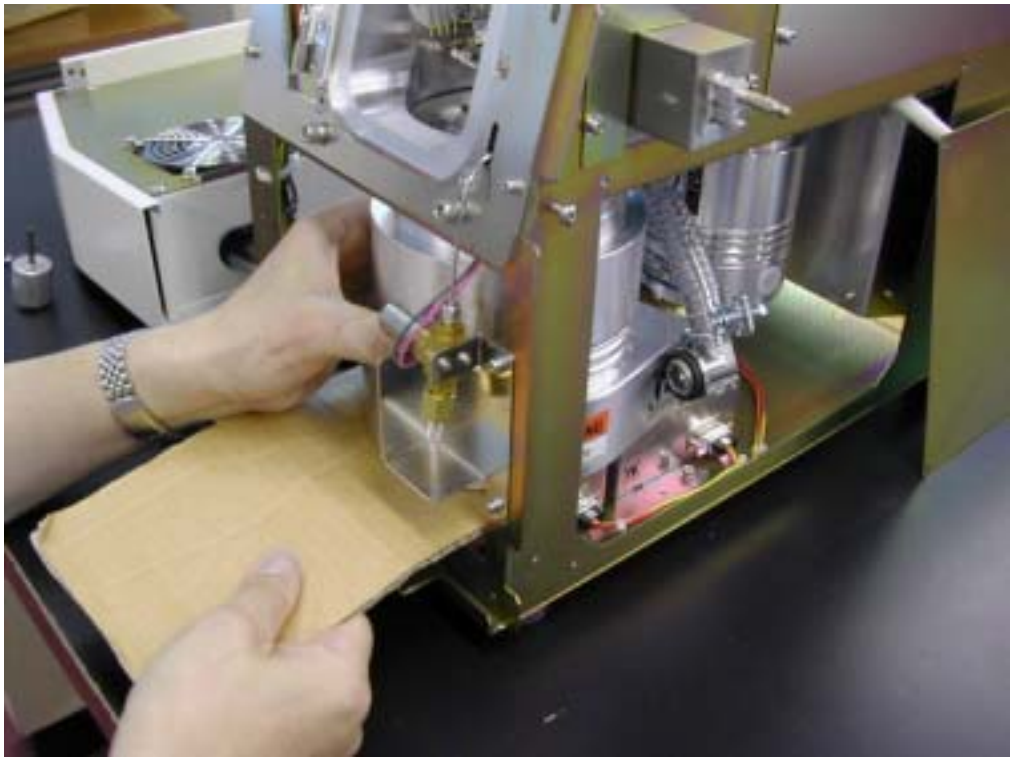
Fasten lightly the 4 screws.

Adjust the mounting angle to be rotated, as shown in figure. Make sure that the edge of the bottom side does not protrude.

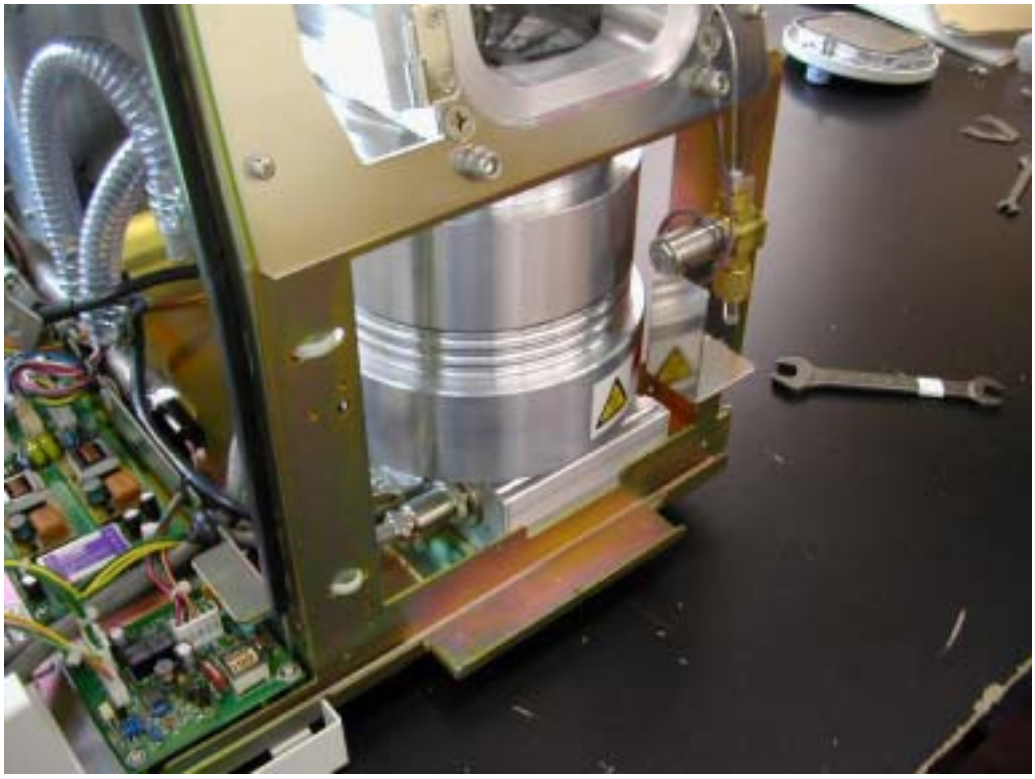


Tighten step by step opposite pair of 4 screws in turn.

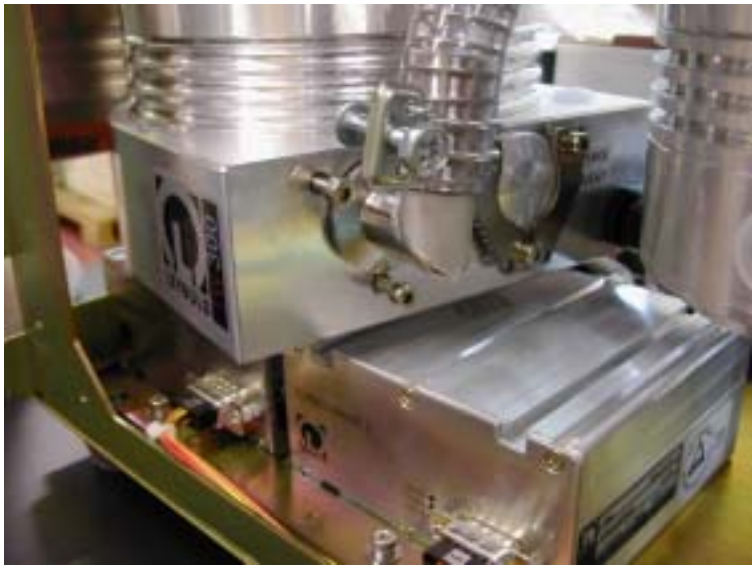
Remove the cardboard.



Completion of TMP mounting



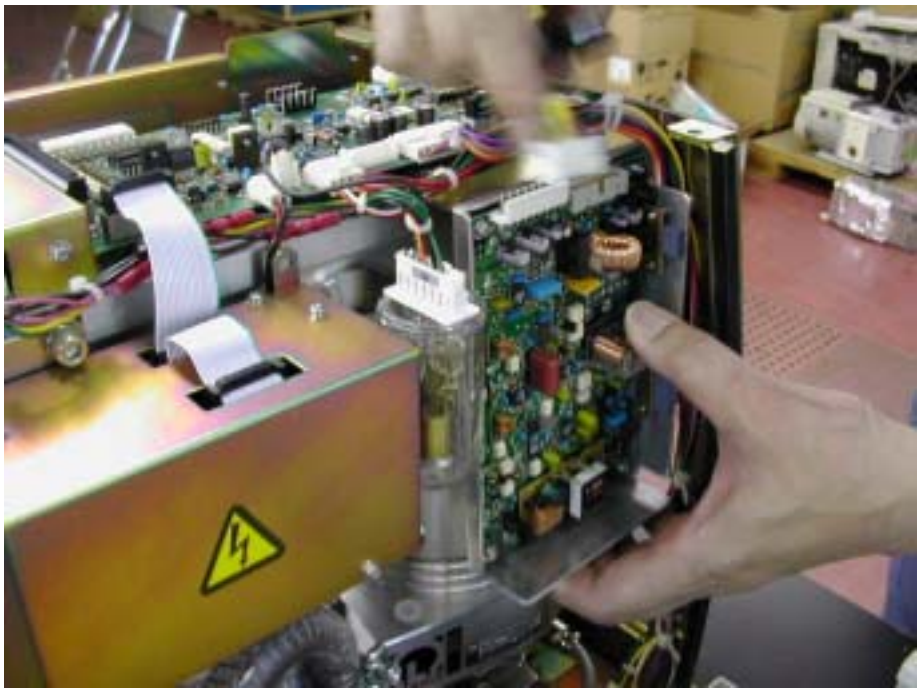
12. Fix the flange to outlet



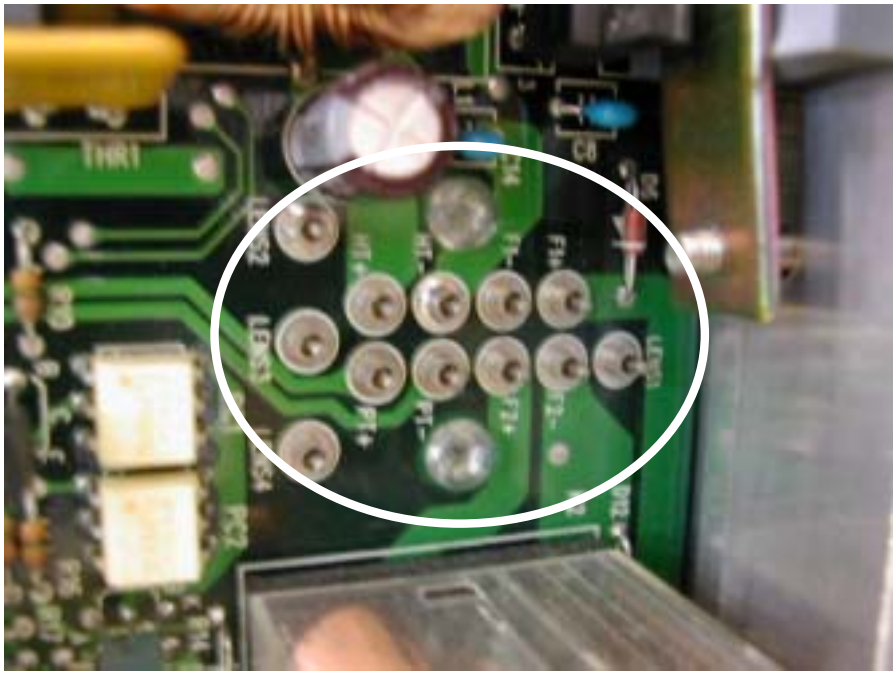
Place the flange on the outlet. (Do not forget to place o-ring)

13. Reinstallation of IS CTRL-A Board unit

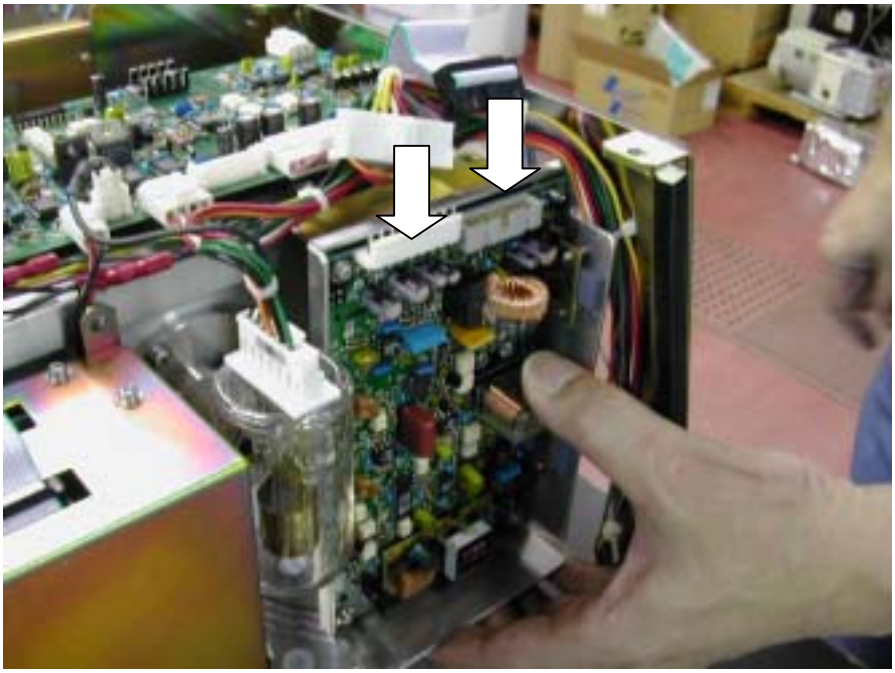
Push the feedthrough into the connector on IS CTRL-A board. This work can be easily done if you put the metal plate for fixing on the vacuum manifold and slide horizontally the board unit. (Be careful not to put insufficiently strong power into the feedthrough.)



Make sure that all pins of feed-through are stuck into the connector holes of IS CTRL-A board.



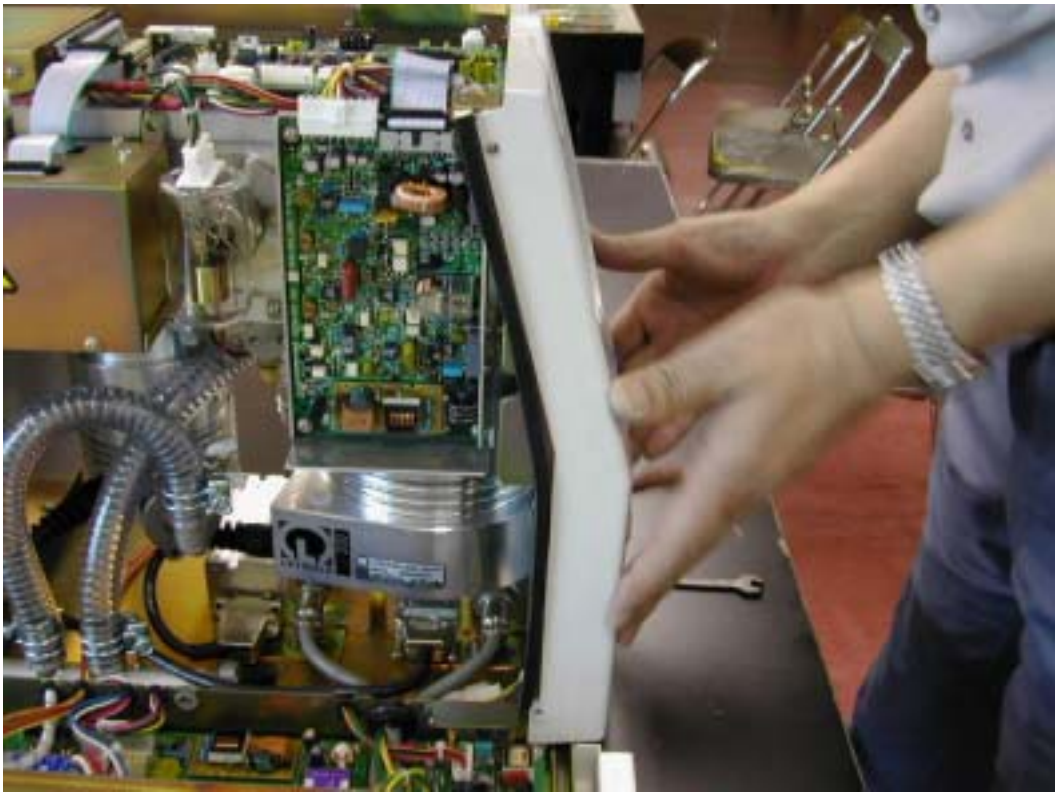
Slide fast the IS CTRL-A board down and fix it. (4 screws)



Connect the two connectors.

14. Place the covers.

Place the front cover.



Place the front door.

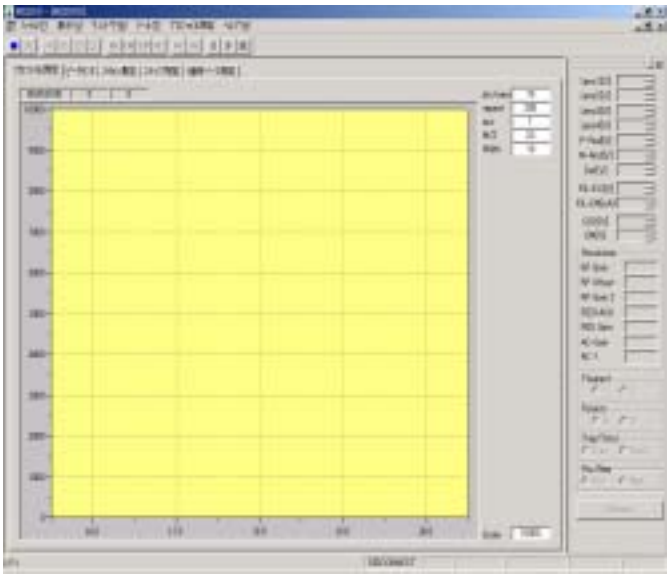
Replace the power unit box and the top cover.

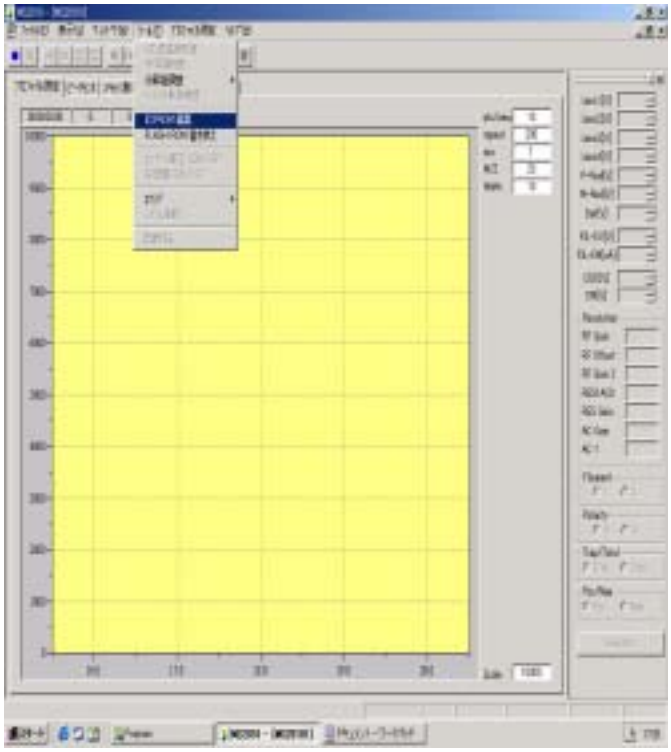
Connect the control cable for interface temperature. Make sure that there is no vacuum leak by plugging interface and starting instrument before connecting GC and MS.

Reset the operating time of turbomolecular pump as the following procedure.

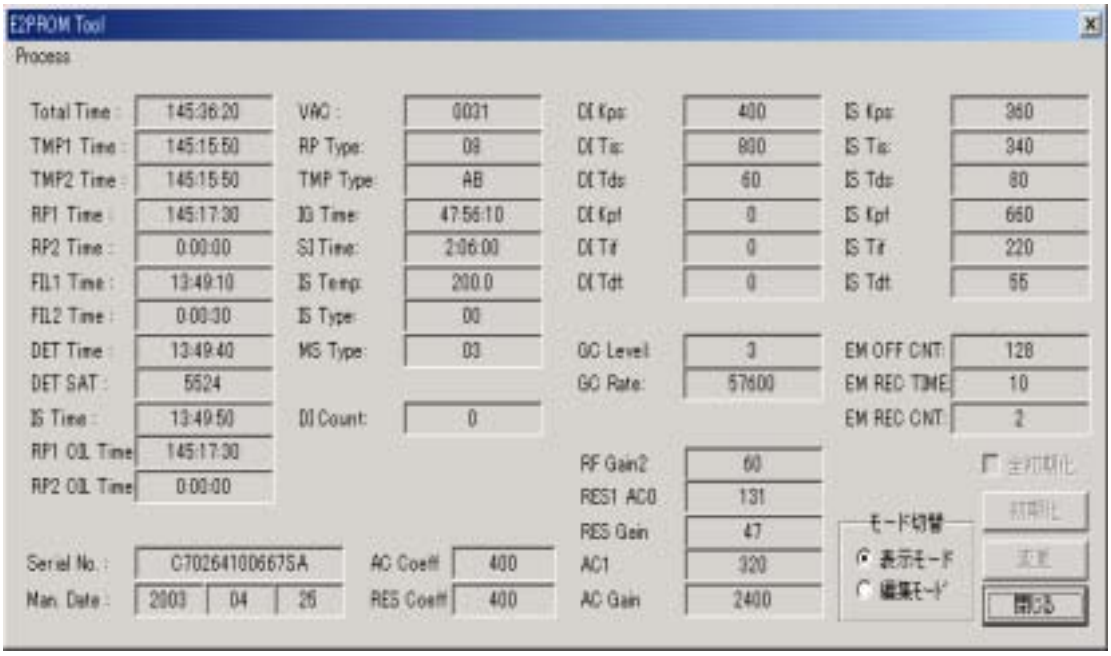
Resetting the operating time of turbomolecular pump

Execute the software “MS2010.exe”.
(This software is stored in C:¥GCMSSolution¥PROGRAM¥MS2010.)
Enter password. : ********
The following screen will be opened.

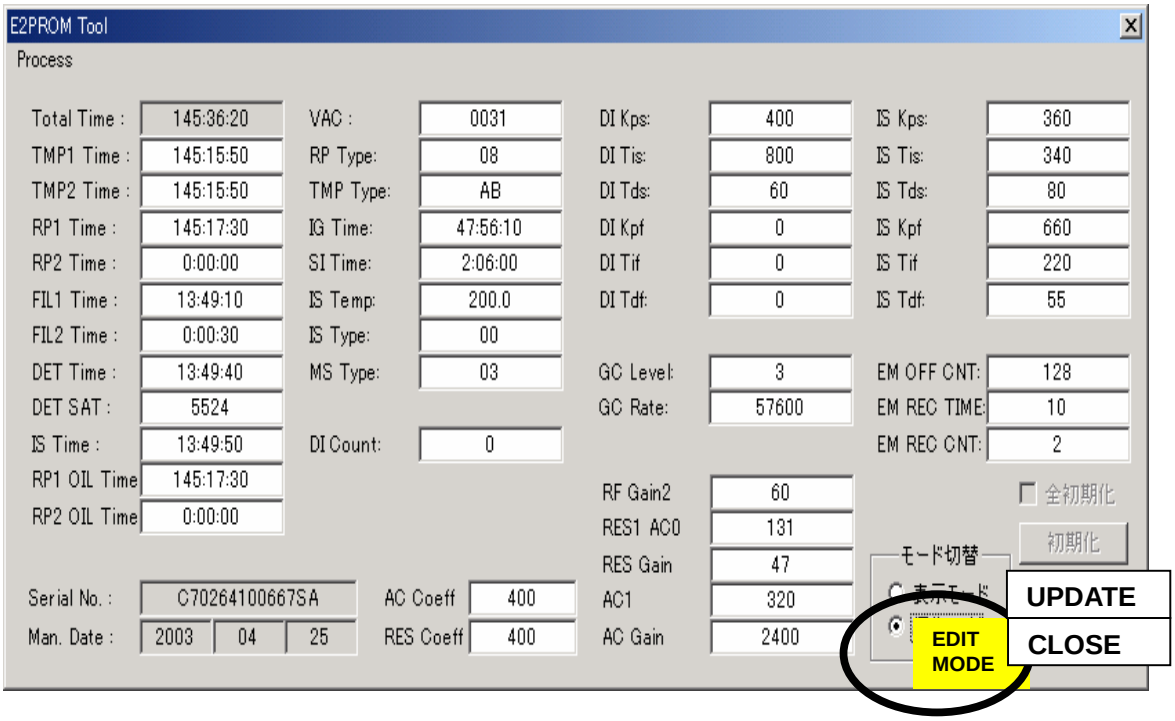




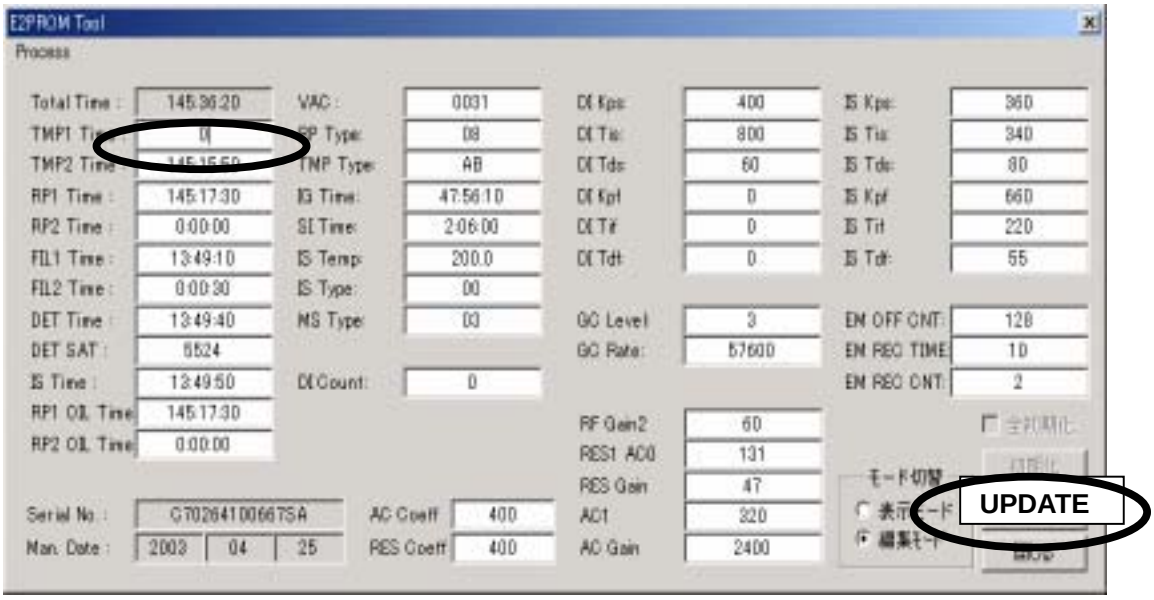
Select “Tools” from the toolbar menu.
Click “E2PROM”.



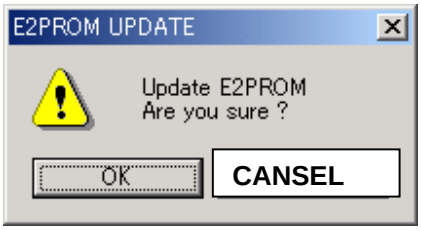
The above screen will be opened.
Write down the value of TMP1 Time in the working report.



Select “Edit mode”.



SET”0” TMP1 Time if if TMP1 has been replaced with the new one. Click the button “Update”.



Click “OK” to close the window.

The operating time of TMP1 has been reset.
Write down the serial numbers of the troubled TMP and the new TMP in the working report.

Start up the instrument.
Make sure that there is no vacuum leak and the result of autotuning is normal.
Explanation to the customer.

Completion of replacement work !